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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the *Railroad Gazette* is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the *Railroad Gazette*, together with additional British and foreign matter, and is issued under the name *Railway Gazette*.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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CONTENTS

EDITORIAL:

The <i>Railroad Age Gazette</i>	657
"Commodity Clause" of I. C. Law.....	657
The Massachusetts Trolley Decision.....	658
Starting Piece Work.....	658
Texas & Pacific.....	660
New Publications.....	661

ILLUSTRATED:

Heavy Tank Switching Locomotive for the Great Central Railway.....	662
Walter G. Berg.....	667
Erle Terminal Improvements, Jersey City.....	669
The Shanghai-Nanking Railroad.....	674
Protecting Wet Cuts in India.....	676

MISCELLANEOUS:

Mountain Railroad Location.....	663
New Mexican Central Organization.....	667
Railway Signal Association.....	668
Block Signaling by the Train Despatcher.....	668
Railroad Regulation.....	672
A Compact Train Sheet.....	676
Car Surpluses and Shortages, April 29.....	676
Transportation on the Great Lakes.....	678
Foreign Railroad Notes:	
Chinese Railroads.....	662
Prairie Locomotives in Hungary.....	
Earnings in January in Germany.....	
Andian Tunnel.....	
East African Railroad.....	667

The International Sleeping Car Co....	680
Salaries of Railroad Officers, Hungary.....	
Electrification of the Giovi Tunnel.....	

GENERAL NEWS SECTION:

Notes.....	681
Interstate Commerce Commission Rulings.....	682
Trade Catalogues.....	683
Meetings and Announcements.....	685
Elections and Appointments.....	685
Locomotive Building.....	686
Car Building.....	686
Railroad Structures.....	686
Railroad Construction.....	686
Railroad Corporation News.....	688

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FRIDAY, MAY 15, 1908.

Beginning with the issue of June 5, the *Railroad Gazette* and *The Railway Age* will be issued as a single, combined periodical under the name *Railroad Age Gazette*. The business of a railroad paper is to collect from all parts of the country and all parts of the world, a current record of all that is best in railroad practice; to comment on what is noteworthy and, from its plentiful sources of information, to develop the truth. The *Railroad Gazette* has been doing this for more than 52 years; *The Railway Age* for 32, and each paper has worked hard and has built up a staff of editors and established lines of communication that make the facts sure and the comment easy. Besides this specific task, it has been the duty of these two papers to make railroad men more useful to their companies and to themselves by giving a broader aspect to the work of highly specialized departments; by making the mechanical engineer know what the traffic man was thinking about, and the division engineer and the auditor alike realize that they could not attain their highest usefulness in working for their departments unless they were working for the company as well. But there has been much duplication in this work. The principal office of one paper was in New York; the principal office of the other was in Chicago, and each office force had to hunt in the territory of the other. A consolidation with strong editorial forces in each city and with mutual co-operation instead of antagonism will leave for new work all the time formerly spent in overlapping. This, from the standpoint of the editor. The reader will have even more reason to be satisfied. He will get more valuable material, carefully selected, than the sum of the previous totals, and will not have to search two papers for it. It is surely not a vain expectation that with the combined organizations, working in Chicago and New York with full vigor, a railroad paper can be made a good deal better than any that has ever existed before.

The simple and direct way to settle the question whether the coal railroads shall be forced to sell their coal properties and

confine themselves to the business of transportation would be to proceed against them in the courts at once; but the rational way is to do as the President and the Interstate Commerce Commission have done—to try to suspend the law until its constitutionality can be settled by an amicable suit. This course will be sharply criticized, of course; for the public officer who refrains from enforcing a plain statute can have no satisfactory defense except unanimous public opinion. Congress, which made this crude law, ought now to suspend it; but unfortunately the only considerations receiving attention in the Senate are those of personal jealousy or supposed political expediency. The Commission, in its reply to the Foraker resolution calling for information, said that the receiver of the Western Maryland (which road was specifically inquired about) had not observed the law, but the extent of its violation and the conditions which made it impossible to comply are points which are not yet explained. The receiver promises to send the information. As to other violations the Commission has not had time since the law went into effect (May 1, 1908) to get information as to whether its provisions are being observed or not. The commissioners declare that in recommending that the penalties of the commodity clause be suspended they acted with the approval of the President. The financial depression has rendered it impossible for railroads to convert their coal properties into money. "The Commission believed and still believes," says the report, "that it is in the public interest, as well as a matter of fairness to parties directly concerned, to suspend penalties for violation of this provision—penalties not specially imposed by its terms, but resulting from the general provision of the regulating statute—for a sufficient time to test in the courts the validity of the enactment." Not only fairness, but expediency also, demands that the matter be sent to the courts; for the ownership of coal mines, timber lands and other great properties is, in many railroad companies, so divided among stockholders and old and new bondholders, that to devise an equitable basis of segregation may be impossible. When the settlement of a question is impossible, only the Supreme Court can settle it—if the reader will pardon the paradox. The question whether Congress will do anything must wait, apparently, until the multifarious political questions now uppermost shall have been settled, which means probably the last day of the session. Congressmen now expect to adjourn next week Saturday.

THE MASSACHUSETTS TROLLEY DECISION.

A law of the state of Massachusetts enacted more than 30 years ago provides that "no railroad corporation, unless authorized by the general court, shall directly or indirectly subscribe for, take or hold the stock or bonds of or guarantee the bonds or dividends of any other corporation" except certain corporations named in five following sections of the act among which are not street railway companies. In those far away days at the time of the passage of the law no serious question of the relation of the old horse railroads to the steam roads had arisen. When, with electricity supplanting horse-power the question became acute especially in connection with long distance electric parallels, the New Haven company began, through its holding corporation, the Consolidated Railway Company, an active policy of acquiring trolleys in Massachusetts. Under President Hall, with legislative assent, it took in a trolley line in that state connecting with its system in eastern Connecticut. By President Hall's successor, President Mellen, the same policy was pushed swiftly under the legal theory that the Connecticut holding company was well within its legal rights. Opposition arose in Massachusetts and the trolleys were transferred to a "voluntary" holding corporation at Boston. The Attorney-General of the state brought suit under the quoted statutory phrase alleging that the New Haven Company was "indirectly" holding the trolleys and should surrender them. The Supreme Court of the state, consisting of five judges, in a unanimous opinion has now sustained him.

The opinion, which lies before us in its full text, is of the most sweeping character. It asserts, in the first place, that the device of a holding company constitutes an "indirect" holding of the Massachusetts street railways not less real in its influence and control than that of the New Haven Company over its steam lines. But the finding apparently goes ever so much further. Although the New Haven Company owns but six miles of track of its own in Massachusetts under its old charter—between the state line and Springfield—the responsibility of the corporation, which is chartered in both states, to Massachusetts is asserted, and asserted apparently almost without qualification where the corporation's acts conflict with Massachusetts policy as expressed in the statutes of the state. It is true that the court waives consideration of acts the results of which are specifically localized to Connecticut. But it does not exclude them; and where the acts affect both Massachusetts and Connecticut the court, by strong implication at least, includes them. The decision thus becomes far reaching. It hits so far as one state can do it, many of the numberless acts of President Mellen and his predecessors done under Connecticut law in pursuance of the policy of consolidation. Such matters as the issue of new stocks and bonds, purchase or lease of trolleys, guarantees, acquisition of navigation properties—not transatlantic—valid under the laws of Connecticut and Rhode Island, become illegal under Massachusetts statutes. Pressed home the decision would apparently disrupt the whole New Haven system and invalidate the Boston & Maine purchase. And, in its narrowest aspect, there arises a very grave question of state jurisdiction in the case of a doubly chartered corporation. Questions are raised in the finding of vital importance to every railroad or other transportation company in the land holding charters in two or more commonwealths.

But limiting the decision to the Massachusetts street railways held "indirectly" by the New Haven Company the case becomes sufficiently impressive. That corporation now holds no fewer than 16 street railways in Massachusetts taken in mainly as a protection against threatened long distance parallels. Saying nothing of the various holding companies the 16 lines are represented by \$11,626,200 of stock, \$6,360,000 of funded debt and \$3,234,924 of floating debt—a total of \$21,221,124. The 16 lines include 565 miles, the Worcester system alone having 158 miles, the Springfield system 99 miles and the Berkshire system 80 miles. They represent one-fifth of the total mileage and about one-sixth of the total capital of the Massachusetts street railways. They reach 56 Massachusetts towns and cities with a population of about 250,000. If this vast interest is to be surrendered under the logical decree of the court where is it to go? Is it to be sold out to a new holding company not under the New Haven's control? Is the state to take it and try again the not too halcyon Fitchburg venture in terms of street railway? Is it to pass by auction at forced sale either as a whole or in disintegration? To whom is it to go and is the acquiring interest likely to be more friendly to public interest than the New Haven; and where, in the final adjustment, are the holders of what

have been conservative securities sustained practically by the guarantee of a great railroad corporation to come out? But it is certain that its Massachusetts trolleys, which happen to be the most prosperous and promising group of its street railway system, will not be parted with by the New Haven, save in the last extremity.

The situation is interesting, acute and not a little confusing. In its foreground is the question of state jurisdiction raising the vital legal point whether the state of Massachusetts or the New Haven Company is *ultra vires*. It seems very likely now that this must go to the highest federal court to which apparently it can readily be taken in the case of an interstate road like the New Haven or by a stockholder non-resident in Massachusetts. For the general interests of the railroads of the country and, as determining certain new questions in "double charter" jurisdiction as well as the scope of holding companies, such an outcome is not undesirable. In that connection it is to be remembered that the New Haven Company is now acting under and vested with the enormous powers, so far as Connecticut can bestow them, granted by a recent legislature of that state in the "omnibus" charter of the Consolidated railway corporation. The alternative of an appeal to the federal court is that the railroad company and the Massachusetts legislature get together, recognize that the case is one of conditions and not theory, and reach a final settlement and permanent arrangement—perhaps with the disputed trolleys vested in a new corporation with the state strongly represented in the directorate. It would be a natural and sane outcome of the present confusion of laws, interests and policies. But in the existing strange temper of Massachusetts, not less remarkable as exhibited in a state highly capitalized and of conservative traditions, no man can predict the sequel.

STARTING PIECE WORK.

The piece work experiences which were printed in the *Railroad Gazette* last week, show pretty well that railroads which run their shops on this plan are abundantly satisfied with the result, and that individual workmen are pretty sure to earn higher wages than they have been earning on the day wage plan. The difficulty comes in installing piece work in shops where it has not before been tried. The arrangements have a way of failing entirely if they are not made right, and there are plenty of railroads to-day which would be only too glad to start in on piece work Monday morning if they were not afraid of a bitter conflict with their workmen. Within the last three months two large and important railroads have failed signally in an attempt to institute piece work, and the failure in each case was apparently largely a diplomatic one.

The statement can be made without much fear of contradiction that in the present temper, piece work cannot be introduced by placard and by public announcement that on a certain day a certain arbitrary scale of prices will go into effect. One railroad system that has had great success with its piece work and now does a large part of its shop work on that basis, has devoted much thought to the diplomacy of the problem. Its methods are something like this. The superintendent of motive power has a series of conferences all along the road with the best men in his shops. He invites them up to a room of his hotel, gives them cigars to smoke and tells them how much they could earn on the piece work plan. That is all that he does on the occasion of his first visit. The next time he comes, he gets two or three steady men to figure out how much a certain job is worth on the piece plan, but he is in no hurry to establish the plan and there are no placards. By and by, after he has gotten what he calls the piece work feeling running strongly, he starts in by allowing a few of the best men to start working on this basis. There is no compulsion about it at all. They do not have to work on this plan unless they care to, and the day wage is guaranteed them in any event (as long as they remain in the employ), whether they earn more or less on the piece work plan. Consequently, it does not take long for a \$2.50 man to decide to take a chance on earning \$3.25, since he is sure that if he can hold his job at all he can earn \$2.50 at it.

It may be said that this road has laid down two cardinal principles of action in piece work shops. One is that the piece work price shall be established by the workmen, and not by the bosses; the other is that the piece price, when once established, is just as sacred as the day wage; that is to say, it will not be juggled about to reduce the earning capacity of able men and to act as an unfair goad to men who are less able. The plain intention of the company is that the men shall be able to earn the day wage at which

they are classed and something more. In one case, under piece work, one man was able to produce so much above the ordinary day work output that he saved the company exactly and definitely the installation of an \$11,000 machine. If the interest and depreciation of this machine be figured at \$1,100 a year (and this is rather low), it is clear that the company could very well afford to let the machinist earn a good deal more than his day wage. After a couple of months' time, during which this man had been earning \$125 a month for himself, the superintendent of motive power said to him:

"George, how do you like piece work; would you rather go back to the day wage basis?" The machinist replied:

"No sir, my wife wouldn't let me!"

Guaranteeing a day wage and making the piece work plan operative only above it and not below it, is an arrangement that produces very important benefits and, in the long run, costs nothing. If the large majority of men in the shop cannot earn more than their rated day wage when working piece work, there is something wrong with the piece work price. As a recent speaker before the New England Railroad Club said: "If you establish an irritating policy of rate cutting, the result is that the workman is afraid to work at his best speed, and it often pays to have a relatively high labor cost if it will increase production, because with large production all forms of fixed charges tend to decrease—interest on the cost of plant and machinery, and superintendence as well—and the total expense cost with high production is apt to be reduced faster than the labor cost goes up. A railroad shop, like any other kind of a shop, gets a bad name with its neighbors very quickly if it is in the habit of reducing piece work prices periodically by the standard of the fastest worker, and there is no surer way than this of creating an organization within the shop that makes it its business to see that nobody works too fast, and is detrimental to the interests of the company and of the able workmen alike. Of course, when new tools are installed or a radical change is made in old tools, enabling unit production to be greatly increased, it is necessary and fair that prices should be revised; but the people to do the revising ought to be the expert machinists, and they ought to be trusted. In one shop the piece work price for boring locomotive cylinders had been fixed at \$3.50 for years. With the installation of a very much larger tool, it became necessary to revise the price, and a steady, reliable man was given the tool for a week and told to figure out the price at the end of that time. The price he figured was \$1.20, and it made money both for the workmen and for the company.

One difficulty which occurs to everybody in connection with piece work is that it reduces the inclination of a man to help his neighbor and to lend a hand at times when time and money can be saved thereby. The solution for this is to install gang piece work. A case has been cited where one plant employed seven men in its shipping room. This gang was reduced to five men and put on piece work, the members of it being paid in proportion to their day wage rating. The result was that an increased number of shipments were handled and that the total cost of handling was reduced. It is possible to extend this co-operative gang principle to the entire shop, and in some cases this has been done with considerable success, but it is usually necessary, in order to make the gang plan successful, that the work be pretty well unified and that there be enough repetition about the daily output so that standards can be definitely and clearly known. There are cases, however, where shops doing work of the greatest diversity will tackle jobs, new or old, just as they come along, on the gang piece work plan, and keep the men satisfied and the work done cheaply, the price for each new job being established by guess work from its relation to the established day wage ratings.

It might be supposed in a case like this that it would make a good deal of difference who did the guessing, but it does not take the men long to find out whether or not the intention is fair. If they believe that the boss really means to have them earn more than their day wage, they are not disposed to criticise occasional errors in judgment; if they believe he is trying to drive them and have the company make all the profit, he is going to have his hands full. Of course, it is obvious that in making calculations of this sort the day wage ratings must be kept alive whether anybody ever works on that basis or not, and it must be clearly understood what the normal daily earning capacity of a man is before he can be rewarded for increasing that capacity to the mutual advantage of himself and his employer.

One superintendent of motive power, whose division was located in a district where labor union control was very strong, had for

some time been unsuccessful in his efforts to establish piece work. The organizers told his shopmen that men who worked under piece work disliked it and had to work a good deal harder than the day wage men to earn the same amount of pay. To settle this bugaboo the superintendent of motive power picked out a delegation of six men who were reliable and carried weight with their neighbors, and sent them down to the head shops of the company, where piece work had been in effect for a great many years. After they had spent a week there and had abundant opportunity to talk with the workmen, they changed their views entirely and went home quite anxious to be allowed to earn as much as the piece work men were earning. In another instance where a large road was endeavoring to install piece work in a certain shop, the attitude of the union bosses became very threatening, and the superintendent of motive power had a long talk with them without evasions or subterfuge. "I don't mind your calling the men out in the X shop, where the piece work is going in," said he, "so long as you don't call men out all over the rest of the system at the same time. I don't think that's fair. There is no trouble anywhere else, and no shops are involved in this but the X shop."

The union delegate agreed that this was the case, and, with the rules of the game thus laid down by both sides, piece work went on in the X shop. The delegate tried to call the X men out, but they would not come, and the road kept the piece work without a strike—in fact has had no general machinists' strike since it began working piece work.

Some roads which do not guarantee their men their prevailing day wages right along, make a brief guarantee when piece work is first established, with very good success. One road says that when starting the men on the piece work basis they are always assured that if they do not in the first thirty days earn as much as they have been earning on day wage, they will get their day wage anyhow, but this guarantee has never yet cost the company anything. The men have invariably earned more than their guaranteed basis.

One road replies that the opponents of piece work are continually advancing theories against the inauguration of any shop system which tends to depart from the day wage basis, on the ground that it results in specialization—in doing away with the all-around mechanic and in making it impossible to secure a desirable line of apprentices, but the company does not find that these claims are well founded. It has a list of applications for apprenticeship far in excess of requirements, and is enabled, without difficulty, to select what it considers good prospective mechanics. The company believes that with the proper apprenticeship system there is no reason why the apprentice should not have as good an opportunity to learn his trade throughout under the piece work system as he has under the day work system, although it is true to some extent that men, after completing their apprenticeship and working under the piece work system, are more inclined to remain on a particular line of work, in which they have acquired dexterity and facility. But this company has never had trouble in filling any position, nor have its apprentices created difficulties by leaving the company after completing their apprenticeship, although it is surrounded by shops working under the day work plan.

The union delegates claim that when it is desired to make a good showing under a piece work system, extra supervision is given and extra care is taken to select new and efficient tools and machinery. They claim, also, that quality under piece work suffers. But the widest experience, extending over a very large group of railroad shops, demonstrates clearly that these objections are theoretical rather than practical. While it is necessary under the piece work system to employ inspectors whose duties consist of taking the men's time and making a list of the work done, and also seeing that the work is properly done, the foreman does not have to watch his men as much as he does when working day work, because the piece work man is directly interested in seeing to it that he has enough work on hand to keep himself busy—an interest which has never been conspicuous under day work. As far as quality of work turned out is concerned, it is true that instances occasionally arise where piece work cannot be used with the highest advantage. One road has a corps of English and Scotch machinists employed in tool making, and pays them a high day wage—although almost all the work of the shops is done by piece work—because it wants them to devote substantially all their attention and interest to quality, the quantity of their output being entirely a secondary consideration. But cases like this are relatively scarce, and sometimes even such a situation is handled by figuring quality as well as quantity in the piece wage plan. A case has been cited of a leather plant, where the ends of leather strips for belts are cut off and the

strips matched. On day work, the waste in this operation was $4\frac{1}{2}$ per cent.; a piece work rate was fixed around 28 cents per hundred strips for $4\frac{1}{2}$ per cent. waste, and ran up to 42 cents per hundred when 2 per cent. was reached. The result to-day is that the average waste is $2\frac{1}{2}$ per cent. In other words, it is perfectly feasible to pay men a special price for being careful as well as for being quick.

From the experiences of an important group of railroads, the following conclusions about piece work can be reached:

1. It gives the officers, all along the line, far better control of their men than is the case under day work.
2. It increases the efficiency of shop output and saves the company money.
3. It makes money for the workmen, and they are usually well satisfied with the piece work system after they have had experience with it.
4. The men are sure to be encouraged in hostility to the introduction of piece work by their union leaders.
5. Piece work cannot be introduced successfully by placard, but must be worked out by diplomacy and by fair and intelligent co-operation with the men.
6. There must be no juggling of piece prices after they have once been established on a equitable basis, and they should be as sacred as the day wage, and the men allowed to earn all they can.

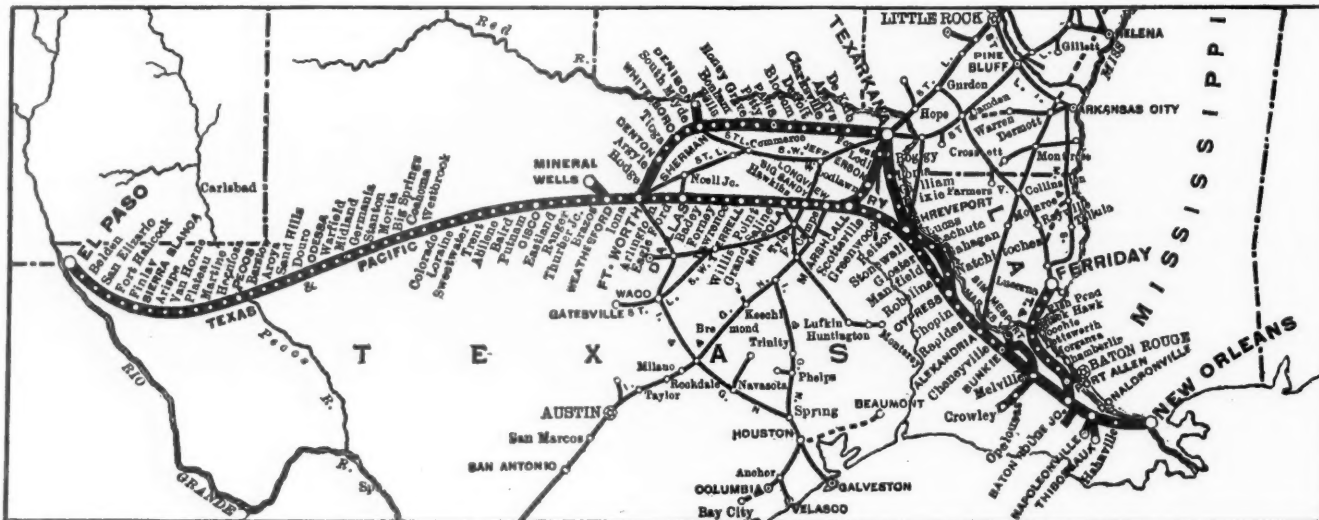
Although the practice is not universal, it may also be added that in introducing piece work excellent results can be obtained by guaranteeing the day wage.

Texas & Pacific.

The company at the beginning of 1907 had a particularly bright outlook for a prosperous year. It had spent comparatively large sums on additions and betterments in 1906, and for the first time in its history, the Rio Grande division added materially to the gross earnings of the company. The road is divided into three divisions: the Rio Grande division, from El Paso, Tex., to

The cost of conducting transportation was \$7,146,000 in 1907, an increase of \$1,068,000 over the previous year, and beside this increase there was \$100,000 charged to traffic, as prescribed by the Interstate Commerce Commission. These traffic expenses were included in transportation in 1906, so that the actual increase in the cost of conducting transportation was \$1,168,000. Some details of the increased cost of labor are as follows: Station employees were paid \$876,000 in 1907, an increase of \$180,000 over 1906; yard conductors and brakemen were paid \$349,000, an increase of \$64,400, and road trainmen were paid \$827,000, an increase of \$180,000 over 1906. The fact that the Pecos valley region was being rapidly developed and settled was probably one of the causes of the increased cost of labor. On the Rio Grande division the increase in cost of conducting transportation was more than twice as great as the increase on the Louisiana division, and almost twice as great as the increase on the Eastern division. On the other hand the company handled its freight and passengers more efficiently. The average number of trains run daily in freight service was from 105 in 1906, and 132 in 1907. The train load in 1907 was 215 tons, a decrease of only two tons from 1906. Revenue from local freight carried was \$1.86 per ton in 1907, an increase of 2 cents per ton, over 1906, and the revenue from other freight was \$2.31 per ton, an increase of 8 cents per ton over 1906. The revenue per local passenger was \$1.19 in 1907, an increase of $3\frac{1}{2}$ cents over 1906, and the revenue per through passenger was \$3.07 in 1907, an increase of $5\frac{1}{2}$ cents over the previous year.

The real causes of the company's unsatisfactory showing for 1907 is to be found in the bad cotton crop, and the large sums necessarily expended for additions and betterments. The revenue from carrying cotton was 10.7 per cent. of the total freight revenue in 1906, while in 1907 it was but 6.6 per cent. In 1906 the road carried 879,325 bales of cotton, while in 1907 it carried only 712,617 bales. On the other hand, the cost of transportation of this cotton was almost as great in 1907 as in 1906, because the movement of freight west on the Texas & Pacific increased, and as cotton moves east the road had increased facilities for carrying cotton at the very time that there was a decrease in the amount of cotton offered for shipment. The year of 1907 was one of short farm crops in Texas. Wheat and small grain crops were nearly an entire failure owing to the depredations of the green bug. This is the same pest



Texas & Pacific.

Fort Worth, 613 miles; the Central division, or Eastern division, as it is called, including the direct line from Fort Worth, Tex., to Shreveport, La., together with the lines from Marshall, Tex., north to Texarkana, and the line from Fort Worth north to Sherman and east to Texarkana; the Louisiana division consists of the main line from Shreveport, to New Orleans, with a number of short branches in the sugar cane and rice districts, and also includes the line from Baton Rouge, north along the east bank of the Mississippi to Vidalia. It was the development of cotton raising on the Rio Grande division, the increased passenger traffic on this division, due to the rush of emigration to the Pecos river region, and the increase in the tonnage of products of agriculture shipped over the Rio Grande divisions, which made 1906 so successful a year for the company, and seemed to promise so much for 1907.

To a certain extent these promises were carried out. Freight earnings were \$11,300,000 in 1907, an increase of \$1,370,000 over 1906. Passenger earnings were \$4,000,000 in 1907, an increase of \$490,000 over the previous year, but the total cost of operation was \$11,580,000 in 1907, increasing \$1,700,000 over the previous year. Thus, in 1907, the operating ratio was 69.4 per cent., as compared with 66.08 per cent. in 1906. The increases in operating expenses can be largely accounted for by the \$1,246,000 increase in the cost of labor, and the \$456,000 increase in the cost of fuel consumed.

that visited the state in 1901. The fruit crop of eastern Texas was also cut short by early spring frost. To add to the company's difficulties taxes on the property for the year 1907 were \$555,000, an increase of \$215,000 over the previous year, and the average tax paid per mile of road in Texas in 1907 was \$306, an increase of \$186 per mile over the previous year. With the exception of the decreased tonnage of cotton already mentioned, and the very slight decrease in tonnage of flour and grain and miscellaneous animal products, the tonnage of all classes of freight carried in 1907 increased over the previous year.

Maintenance of way cost \$878 per mile operated in 1907, against \$824 in 1906. Unit cost of maintenance and renewals of equipment were \$2,429 per locomotive in 1907, against \$2,184 in 1906, and \$1,624 in 1905; \$1,096 per passenger car in 1907, against \$1,176 in 1906 and \$955 in 1905; \$72 per freight car in 1907, against \$75 in 1906 and \$47 in 1905. The company also spent for new equipment \$1,128,000 in 1907, which is about double the amount spent for new equipment in 1906.

The company assumed obligations of \$2,620,000 due from 1909 to 1917 for equipment. Total current assets on December 31, 1907, amounted to \$2,700,000, while current liabilities at the same time amounted to \$8,500,000. The current liabilities have increased during the year from \$6,560,000 to \$8,500,000. This current liability

in 1907 included \$5,180,000 bills payable. In 1906 it included \$4,550,000 bills payable. During the year 1907 the company added to the securities in its treasury \$1,143,000 Opelousas, Gulf & Northeastern 5 per cent. bonds of 1906-1956, and \$94,372, or 70 per cent. of the stock. The Opelousas, Gulf & Northeastern, a 57-mile line, was completed in 1907, and is now in operation. The Texas & Pacific also spent \$1,098,000 for improvements during the year. Of this, \$264,000 were for ballast, \$104,000 for bridges and culverts, and \$182,000 for shops and roundhouses, and \$48,000 for double track; also \$72,000 for steel rails, since the state of Texas compelled the railroad company to relay part of its tracks with heavier rails. For the period of seven years ended December, 1907, the company has spent \$2,000,000 on new 75-lb. steel rails and fasteners. In addition to these improvements and since the annual report was completed the Texas Railroad Commission has ordered improvements which it is estimated will cost about \$4,000,000. Half of this sum will be necessary for improvements between Fort Worth, Tex., and Sierra Blanca, a distance of 500 miles. The cost of the betterments ordered is variously estimated at from \$800,000 to \$2,000,000. The problem before the company now is one of financing these improvements and of financing its floating debt.

The following table shows the results of operation for the year:

	1907.	1906.
Mileage worked	1,885	1,848
Freight earnings	\$11,273,331	\$9,901,702
Passenger earnings	4,088,132	3,602,006
Gross earnings	16,671,668	14,914,608
Maint. way and structures	1,655,856	1,522,081
Maint. of equipment	2,245,957	1,838,040
Conducting transportation	7,145,760	6,077,626
General expenses	430,334	417,176
Traffic	100,033	.....
Operating expenses	11,577,940	9,854,923
Net earnings	5,093,728	5,059,685
Net income	5,204,281	5,115,702
Fixed charges and taxes	2,286,214	1,981,724
Improvement and equipment	2,226,736	1,518,575
Sundry items	87,517	51,160
Surplus for the year	603,814	1,564,243

NEW PUBLICATIONS.

Standard Examination Questions and Answers for Locomotive Firemen. By W. G. Wallace. Chicago: Frederick J. Drake & Co. 343 pages; 4½ in. x 7 in.; illustrated; flexible covers.

This book is a reprint from the same plates and on thinner paper of the volume on the same subject that forms a part of the Art of Railroad Engineering, or the Technique of Modern Transportation, Vol. IV, reviewed in the *Railroad Gazette* Oct. 11, 1907.

Report of the United States Fuel Testing Plant at St. Louis, Mo. Washington: Government Printing Office. 6 in. x 9 in.; 299 pages.

This report covers the work of the plant from Jan. 1, 1906, to June 30, 1907, and includes the results obtained in 214 tests of coals taken from the states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Indian Territory, Kansas, Kentucky, Maryland, Missouri, Montana, New Mexico, Ohio, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wyoming and a few miscellaneous samples. The work done was divided into coking, steam and briquetting tests, to which a chemical analysis is added. The data are in the form of tables to which a few words of comment are usually added, so that any information that may be contained is instantly available. Of the value of such a report as this and of the work that is being done by the plant, nothing need be said, as it stands for itself, and can be appreciated by any who are called upon to decide in the matter of the probable values of different coals for the purposes set forth. It is information that has long been needed, and is appreciated accordingly.

Standard Handbook for Electrical Engineers. Written and compiled by a staff of specialists. New York: McGraw Publishing Co. 1283 pages. 4 in. x 6½ in. Illustrated; flexible covers. Price, \$4.00.

As indicated by the title page, this book is a compilation by a number of specialists who have written the several sections into which the book is divided. These sections are as follows: Units; Electric and Magnetic Circuits; Measurements and Measuring Apparatus; Properties of Materials; Magnets; Transformers; Electric Generators; Electric Motors; Batteries; Central Stations; Transmission and Distribution; Illumination; Electric Traction; Electrochemistry; Telephony; Telegraphy; Miscellaneous Applications; Wiring; Standard Rules and Tables and Statistics. These 20 sections are written by 11 different authors.

The book differs from the usual handbook in that it offers a wider range of treatment than is usually met in works of this kind. Each section of the book is complete in itself, and though there is a great deal of condensation there is still a thread of connection between the successive parts. In treatment the text differs from the ordinary handbook, giving a discussion of the subject and some further information than the bare statement of a fact or the citation of a formula with the author's name as a credit and as a warrant of its value.

It is of course impossible to review in detail the contents of a book of this magnitude. It can be commended freely for the com-

pleteness of its general scope and the method of presenting the matter contained. Mechanically, it is presented in a very attractive manner. The covers are perfectly flexible and can be turned back to back without in the least straining the binding, and the paper is of the best India Bible quality; thin and yet so opaque that the printing does not show through. There is an elaborate index, containing more than 6,000 headings, arranged alphabetically with topical references, so that the searcher is brought as near as possible to the point for which he may be looking, thereby increasing the value of the work as a means of quick and convenient reference.

Directory to the Iron and Steel Works of the United States. Seventeenth edition. Philadelphia, Pa.: The American Iron & Steel Association. 6 in. x 8½ in.; 516 pages; cloth. Price, \$12.00.

This edition of the Iron and Steel Works Directory is corrected to March 1, 1908. It is compiled in the same way as the 1904 edition. Part 1 describes the United States Steel Corporation and controlled properties and the more prominent independent companies, including mines, railroads, furnaces, mills, steel car builders, etc., arranged alphabetically under the names of the operating companies. Part 2 describes all other iron and steel works in the United States, and, for the sake of completeness, the names and addresses of those described in Part 1 are also here included. The arrangement is by states and districts. Part 3 describes all rolling mills and steel works arranged according to products. Part 4 gives information of changes in officers and ownership which occurred while the rest of the book was in press. This edition of the directory is larger than the previous edition, the increase in size being in proportion to the growth of the industry. It lists 448 furnaces, as compared with 428 four years ago, the annual capacity having increased from some 28,000,000 tons to over 34,000,000 tons. There are now 598 completed rolling mills and steel works, as compared with 572 in 1904. The value of the book is due not only to the fulness and accuracy of the information, but also to the classifications of the descriptions and the indexing system, which makes it easy to quickly find the information wanted.

Concrete. By Edward Godfrey. Published by the Author, Pittsburgh, Pa. 448 pages, 3¼ in. x 6½ in.; illustrated; semi-flexible cover. Price, \$2.50.

The opening sentence of the introduction announces "that the book is written to point the way to sound engineering in concrete by enunciating the principles thereof and by laying bare the falsity of much that passes for good engineering in this comparatively new branch of construction." And throughout, the author manifests the confidence that he has in his own ideas, with a vigor that must hold the attention of the reader, while he shows but little respect for the ordinary methods of handling concrete. The book resembles a series of separate essays on the subject in which each chapter is complete in itself and can be read in that way. The idea of the individuality of the several parts is emphasized in the methods of handling formula in a way that will be appreciated by every one who has occasion to use the book for reference. This can best be explained by a quotation from the introduction.

"No attempt has been made to carry through the book a uniform nomenclature. Values needed for any equation will be found close to it in the reading matter. The author has found attempted standard nomenclature extremely annoying. A practical engineer has not the time, when he wishes to make use of a formula, to read an entire book in order to make sure of the meaning of the values in the formulas, and he is only wasting time when he must refer back to other chapters for their meaning. It is one of the greatest faults of books of reference and text books that must often be used for reference, that formulas are set down with a view of their correctness, solely; the convenience of the user in applying them being ignored."

Every engineer will say an amen to this statement, and unite in a prayer that others may follow the example that is here set down.

In dealing with the subject itself the author does not offer the same number of examples of construction that are to be found in most books on the subject, but he treats it in the manner of a teacher who wishes to inculcate the fundamental principles of the matter in hand to his readers. For example, in the chapter on the steel that is to be used in reinforced concrete, the quality of the metal is discussed and the kind for use recommended. Its ultimate strength is set aside as immaterial, provided that it and the limit of elasticity are such as to indicate a uniformity of structure. The reasons for preferring a high steel to a mild one are stated, and the tests that it should be able to withstand are given. The author goes through the matter of welds, shapes, bends and other items of the details of construction by dealing with them in a general way that will convey an idea to the designer that will be of value but which will be of little use to the man who is acting as a mere copyist and who is willing to blindly follow others' designs, regardless of the principles involved.

The same method is pursued in the treatment of cement, lime, stone, sand and the other ingredients that are used in concrete

construction. Especial emphasis is placed on the proper construction and handling of the forms that are to be used, and caution upon caution is uttered that they be not allowed to bend or be injured before using.

In the later chapters there are the reprints of a number of articles that have been written for the technical press by the author in which he has criticised, and has been criticised for opinions expressed. Here both sides of the controversy are printed and the reader is favored not only with the ideas of the writer but of those of men who disagree with him.

Of course examples are given of various types of construction and there are formulas for the calculation of the stresses that the material can be made to sustain, and these are especially full for beams and plates or slabs for floor construction. All this is interesting from the manner of its presentation and valuable because it does not content itself with a bare dogmatic statement of fact that must be accepted, but backs up each statement with the reasons for it.

Foreign Railroad Notes.

By building eight miles of railroad from the Chinese Eastern at Changchun westward, a connection is made for the first time from the Siberian Railroad to Peking, and China proper—that is, China south of Manchuria.

During some labor troubles in Milan last October, in which the railroads were not involved, a mob was fired on in the streets. To show their indignation at this, a large number of railroad men

Heavy Tank Switching Locomotive for the Great Central Railway.

The heavy tank switching locomotive shown herewith ranks as the largest and heaviest of its class that has, up to the present time, been put into service on English railroads. It was designed by J. G. Robinson, the chief mechanical engineer of the Great Central, and is intended for service on the hump grades of the gravity yards of the company at Wath, near Doncaster. It was built by Beyer, Peacock & Co., Ltd., of Gorton. In fundamental principle it is based upon the Forney type, wherein the main portion of the engine and the short tender or tank at the rear are carried by a single continuous frame. There is no leading truck but the bogie at the rear serves the purpose of the guiding truck when the engine is running with the cab to the front, which was the original intention in the Forney design. This truck is a compound of a front and rear engine truck. It has the inside bearings of the usual front truck, but with a spring and equalizer arrangement that secures the effect of the one usually put at the rear. The equalizer arrangement is one that is practically unknown in American practice though common abroad. Instead of the deep bars with strength enough to carry the load imposed by the springs between the axle boxes, the springs are set directly over the axles and taking hold of the frame at their outer ends, they are attached to bell cranks at the inner ends, and these latter are connected by a comparatively light tension rod. This makes it possible to obtain all of the advantages of a perfect equalization, with inside bearings, without the use of heavy bars and without interfering with bolsters or brake rigging. This equalization, however, stops abruptly at the truck and does not extend to any of the driving wheels. Here the semi-elliptic



Heavy Tank Switching Locomotive for the Great Central Railway (England).

struck work. Of these 180 were arrested for violation of an article of the criminal code which renders liable to a fine of \$100 to \$600 and to dismissal from the service public servants who abandon their duties in groups of three or more. The preliminary examination, which decides whether these men shall be held for trial, was held recently for a group of 60 of these men, of whom 55 were indicted, as we should say.

The Hungarian State Railroads in ordering 126 new locomotives of the State Engine Works specify that ten of them shall be of the prairie type, which is bringing the American language pretty well to the East.

The aggregate earnings of all railroads in the German Empire in January, 1908, were 0.4 per cent. more from freight and 4¼ per cent. more from passengers than in January, 1907, or 1½ per cent. more in all. For the ten months ending with January their increase was 4.4 per cent., nearly nine-tenths of it in freight.

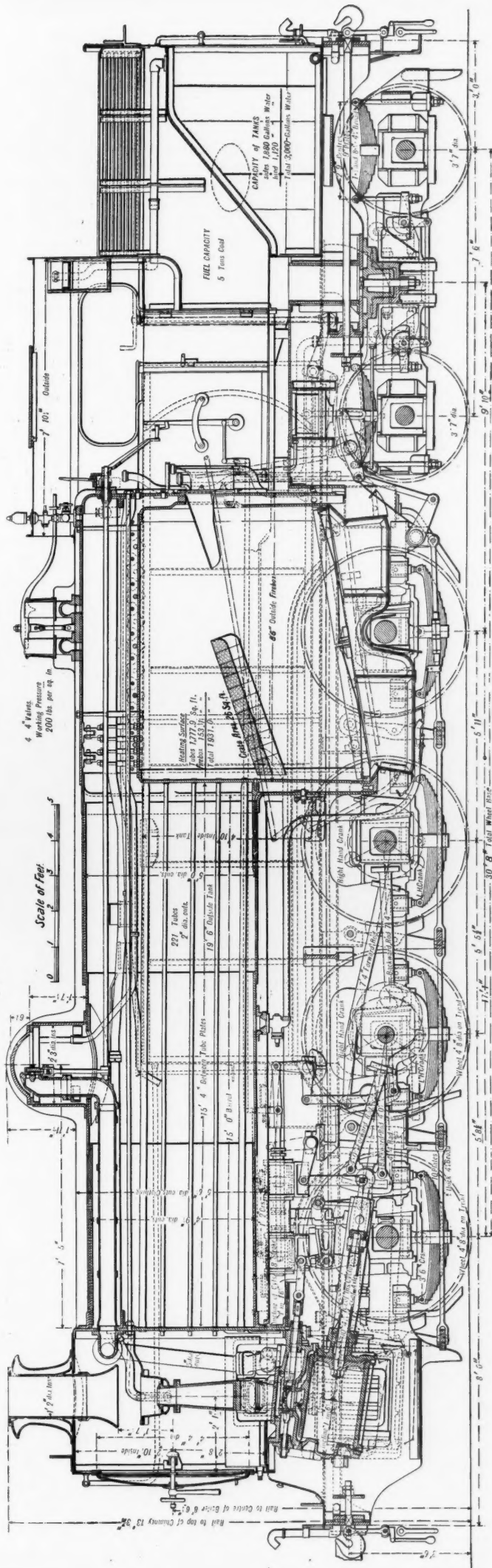
The opening of the Chilean section of the tunnel under the Andes on the Arica & La Paz Railroad is reported by telegraph recently, and has been taken by the newspapers generally as on the trans-Andine Railroad between Chile and Argentina. Actually Arica is 1,000 miles north of the Pacific terminus of the trans-Andine Railroad at Valparaiso, and only about 50 miles southeast of Peru, to which it formerly belonged. The Arica & Tacna Railroad, built by Americans, was famous in its day. It is on an extension of this line over the mountains into Bolivia that the new tunnel is made.

springs are underhung and each takes its load direct from the frame.

The boiler is of the same type and proportions as those fitted to the standard express locomotives of the Atlantic pattern on the Great Central Railroad. It has the Belpaire firebox and slightly extended smokebox. Four safety valves of the Rambottom type are mounted over the firebox, these being adjusted to a working pressure of 200 lbs. per sq. in. The firebox is fitted with a brick arch carried on side brackets, and a deep deflector above the fire door by which the air entering at that point is carried well forward towards the arch before rising and is thus heated to a high temperature before reaching the tubes.

The blow-off cock at the bottom of the shell is fitted with a discharge pipe that carries the water back to a point beneath the ash pan, thus avoiding the wetting of the machinery that so frequently occurs. In this case the pipe is a necessity because of the location of its point of connection to the shell immediately above the cranked axle. The throttle is of the sliding type commonly used abroad and the smokebox has the usual arrangement of English engines.

The characteristic feature of the engine is to be found in its use of three high-pressure cylinders, an arrangement not in use in the United States. They are all of 18 in. diameter with a common stroke of 26 in. The two on the outside are connected to pins in the third pair of driving wheels, while the single inside cylinder drives the cranked axle of the second pair of wheels. All the cylinders are slightly inclined, and each is controlled by a separate link motion. The links are of the Stephenson shifting type and they are operated by a single reversing gear. The lifting shaft for the



Heavy Tank Switching Locomotive for the Great Central Railway (England).

outside cylinders is of the usual type and is worked direct by the connection from the steam reversing cylinder. This is of the ordinary design of a steam cylinder having a piston stroke of 8½ in., with a water cylinder for checking the motion and locking in position. The two links are of different forms, and though they have the same throw the lifting shaft arms are of different lengths; probably for constructional reasons.

The engine is equipped with automatic vacuum, steam and hand-brakes, and the shoes are fitted to all wheels, including those of the truck. The work is on the hump of the Wath yard, where the grade is at the rate of 48.4 ft. per mile.

The following are some of the principal dimensions of the engine:

Tractive effort	38,359 lbs.
Cylinders (3), diameter	18 in.
Piston stroke	26 in.
Wheels, coupled, diameter	4 ft. 8 in.
Wheels, truck, diameter	3 ft. 7 in.
Wheel base, fixed	17 ft. 1 in.
Wheel base, total	30 ft. 8 in.
Boiler, diameter	5 ft.
Boiler, length	15 ft.
Heating surface, tubes	1,777.9 sq. ft.
Heating surface, firebox	133.1 sq. ft.
Heating surface, total	1,911.0 sq. ft.
Grate area	26.0 sq. ft.
Working pressure	200 lbs. per sq. in.
Weight on drivers	165,760 lbs.
Weight, total	215,488 lbs.

Weight on drivers	4.32
Tractive effort	
Total weight	5.61
Tractive effort	
Tractive effort x diameter of drivers	1124.07
Heating surface	
Heating surface	
Grate area	72.72
Weight on drivers	86.74
Total heating surface	
Total weight	112.76
Total heating surface	
Volume of three cylinders, cu. ft.	11.48
Total heating surface	165.41
Volume of 3 cylinders	
Grate area	2.26
Volume of 3 cylinders	
Firebox heating surface	1.36*
Total heating surface	

*Per cent.

Mountain Railroad Location.*

The first requisite for a successful locating engineer is a good party. However capable any man may be he can work only with the materials at hand, and while a good man may secure results with poor tools he can get better results with better tools. Hence the necessity of the best possible party and instruments.

As to the personnel of the party, the common idea that any one who can turn and read an angle correctly is a transitman, he who can read a rod and keep a level book a levelman, while as for the topographer, any son of some prominent railroad official, who never saw a located line, is competent to take that most important place, and the boy who has done the blue-printing at headquarters will answer for draftsman—this idea should be gently but firmly discouraged by the man who finally bears the burden of all their derelictions. Instead, the transitman should be able successfully to take charge of the party in the absence of the locating engineer. The levelman should be capable of running the transit and doing it well, and the rodman should in that case be able to run the level. High priced men? To be sure. But every dollar of extra pay will return tenfold in results, and, after all, are not results what the party is sent out for? The topographer should be able to run either instrument and be a fair draftsman; for if he has at some time been a draftsman he will not bring in a book full of weird, wonderful marks that may mean anything except a representation of the country run over. The draftsman should be a rapid and accurate worker, capable of doing fairly neat work and should have had some field experience; if he has he will be able either to make out the notes turned in to him or be able to call on the field men for such additional data as may be absolutely essential, while not calling for anything that he can calculate in less time than it would take the party to get for him.

As to the rest of the party it should be made up of the best

*From a paper presented to the Pacific Northwest Society of Engineers by J. J. Cryderman, Civil Engineer, Bellingham, Wash.

men obtainable and plenty of them. There is no economy in working short-handed. * * * Usually the engineer in charge is furnished with all the men asked for, though too often the wages paid are grossly inadequate. Why any man who has worked his way up to the position of chief engineer should try to force wages down is beyond me. Of course we understand that a payroll presents a real and tangible thing that can be cut down, but why not pay decent salaries on location and cut down the cost of construction? In other words, hire men who can locate a better line that costs less money to build and operate. This does not advocate paying uniform wages nor salaries, but get good men and pay them decent wages, and not ask them "what is the least money you will take to do this work?" Know what they are worth and pay for it.

After a party is organized the writer has a certain amount of discipline in camp and on line. Seats at table and assignments to tents are made according to rank. If one wishes to talk shop at meals or at night he wants the men he is talking to near. The writer has found as soon as the men understand the arrangement they prefer it. The writer also believes it pays to let the men know as much about the work as you feel justified in telling. In experience the men have taken a more intelligent interest in the work and a caution to them not to talk outside of camp has nearly always been sufficient. In a few cases it has not succeeded, but if you cannot trust a crowd of bright, intelligent young men, such as comprises the average locating party, you had better get rid of them as soon as you can, for whether you tell them anything or not they will talk to outsiders.

In the matter of instruments the writer has used every standard make and many that were not standard and has never yet found the perfect instrument. However, any standard make of mountain transit with stadia wires, full vertical circle, reversible bubble tube and extension tripod, all in first class condition, will answer. The writer wishes to emphasize the requirements: The transit must be light, compact and convenient. When a transitman is hanging on the end of a rope 150 ft. long down a 70 deg. slope he does not want a 35-lb. transit, nor when it is necessary to give levels or read a vertical angle both backwards and forwards does he want to turn his instrument through 180 deg. to do so. As for an extension tripod, the writer has known good engineers who would not have them, but it seems to him to be the rankest kind of folly. We have heard men say, "I don't want a transitman who can't set up a stiff tripod anywhere." The ordinary location party costs from \$5 to \$10 an hour, and why waste that good money showing ability to do something that does not need to be done? They might as well want a transitman who could set up a transit while standing on his head. No stiff tripods should be made for mountain transits.

For the level, any standard make not exceeding an 18-in. will answer, though a 16-in. is better, and there should be at least one extension leg in the tripod, especially if a supported grade line is being run, where the levels need to be kept close up to the end of the line. In such cases the levelman must have every show that can be given him. All the reasons given for a light-weight transit apply to the level also. The writer uses a 12 or 13-ft. Philadelphia rod. Take a light, thin, narrow board 5 or 6 ft. long, and mark the top plainly as a sort of target. With the rod measure off and mark each half-foot down from the top, then measuring with a steel tape place the target mark at some exact even foot above the foot mark on the rod, fastening it on the back of the rod by means of small brads or screws. You now have a 16, 17 or 18-ft. rod, as you may desire, with the top marked to half feet, which answers for intermediate stations and on turns. The levelman reads and sets the target precisely as he would the target on the regular level rod and can add from 25 to 50 per cent. to the speed of the level party over rough country.

Besides the regular 100-ft. steel tapes always carried I have a 400 or 500-ft. steel tape to use on slopes, using the vertical circle and reducing to horizontal and vertical measurement. When the distance is too great for the tapes, or it is impossible to get them across, use the stadia wires and level rod, reducing the readings by the table given by Allen or Lavis. For mending tapes the writer prefers sleeves and solder, with the set-screw sleeve for temporary repairs. It takes less than three minutes to mend the tape with a piece of candle and the writer has never had one pull apart, preferring it to the punch and rivets.

For lining rods the best are the wide rods with a line struck down the center, stagger painted. With such a rod, if the transitman can get even a foot of the rod he can plumb it so he knows his tack is where it belongs.

The writer has the rear chainman carry a rod which he uses instead of the plumb bob for chaining, and also for helping the axman keep line. At first the average chainman has to be watched to see that he does not plant the rod on the ground instead of holding it clear, but he soon gets broken in and it is less bother than a plumb bob and has the advantage spoken of as to keeping the axman in line.

Camp Equipment.—In mountain work, as everything must be

packed on horses or men's backs, equipment must be cut to a minimum, and made in convenient form to be packed.

The writer has found a modified form of the sheet-iron Klondike stove fairly satisfactory for cooking and it can be packed and even a heavy form of it moved on an aperejo or Humboldt. For tables use the canvas lath arrangement. For any one who has not used them it may be explained that they are made of a strip of canvas of the desired width and length with lath tacked or nailed across them, spaced $\frac{1}{4}$ in. apart, and are unrolled on side poles fixed on posts and covered with oilcloth, as with the common plank camp table. They are very light, fairly strong and quite convenient, and can be rolled up and packed like a roll of blankets. They can be used for dining table and cook table in the kitchen, and a small section is convenient for the office.

In the way of dishes, use granite ware, but cut them down to the fewest your cook can conveniently get along with. As that depends on the cook, no rule can be made; however, take along two dozen miner's tin cups with open handles and let each man carry his own cup on line for lunch.

Within the past year the writer has experienced the two extremes as to the facility with which supplies can be obtained or delivered, in one instance being camped beside a trunk railroad, and in the other, being in the interior of Alaska; in the one case being able to get everything in the market, and in the other—well, we did not starve but beans 21 times a week grew monotonous; however, the men were as well in one case as the other and seemed to work as well, and some of the same men were in both parties.

In these days, with evaporated fruits and vegetables and concentrated extracts, it is easier to supply a party fairly well, and still cut the weight to a minimum. In the party this summer the daily weight only ran about $2\frac{1}{2}$ lbs. per man per day, which is about as low as it is possible to get any variety for a party. As it is impossible in a paper of this length to give many details, supply lists of all sorts are omitted, referring any one to the works of E. H. McHenry and F. Lavis for all such information, merely cautioning any one who has had no experience that no two parties ever use the same quantities of any article and McHenry's parties must have had fearful and wonderful appetite for some things, judging from his supply lists—codfish and soap for instance. Likewise the list of Lavis. With the McHenry list is supposed to go fresh meat and vegetables, and if you are where they cannot be had the evaporated vegetables and sugar must be at least doubled, and the salt meats increased one-half. Fruit and flour will over run.

For office supplies take everything you can and keep within weight limit, using the knock-down drafting table and set it up like your kitchen table. The stationery chest should not exceed 12 in. x 12 in. x 31 in. in the clear, and even then is awkward to pack. Take tin map cases for maps and profiles, and when moving camp it is well to roll them in blankets to prevent battering up.

Medicines.—A few simple remedies, but no drug store, are needed. Most of the men carry some favorite remedy for themselves and all that is needed in the company chest are some pills, Sun cholera cure, quinine, some surgeon's needles and sutures in glass tubes, needles and silk thread in envelopes, gauze, rolls of bandages, surgeon's plaster, absorbent cotton, antiseptic tablets and some arnica. The latter is the writer's panacea for all cuts and bruises; one-half teaspoonful in a coffee cup of clear water is the best antiseptic he has ever used, and most cuts thoroughly washed out and sewed up and then kept wet with the mixture will heal without inflammation or suppuration.

If any one in charge of a party has never sewed up a big gash in some man's foot or leg, he had better go to some surgeon of his acquaintance and take a few lessons; he will be apt to get the necessary practice in the mountains.

There should be plenty of room in the tents for the men and they should be supplied with Sibley stoves which can be flattened out when packed on horses. Men come in wet and cold too often to economize on room and warmth. Wherever, as in Alaska, mosquitoes are bad, the company should furnish mosquito bars for the men and the engineer should see that they are used, for the man who fights mosquitoes all night cannot work well all day. As any undertaking succeeds in proportion to the attention given to its details, the writer considers the foregoing remarks as to the party, its personnel and equipment, of first importance.

We now come to the active work of preliminary and location with the methods used. Ability, or the lack of it, is shown by the preliminary an engineer runs. Should it not fit closely to the route followed by the location it is time and money thrown away. Do not understand by this that all preliminaries do, or should, follow such line. Many lines are run where the engineer knows them to be worthless, but he does so to show why the line was not located on that route. But to run random lines to develop the country shows a lack of ability that should transfer the engineer from locating to some other branch of the profession. Given the proper preliminary with good topography, and the final location is a question of mathematics. The skill consists in placing the preliminary not only where the location will go, which any one can

do, but where the location should go, which sometimes is vastly different.

Usually in mountain work the preliminary is for a supported grade line. In such case the writer estimates how much curvature per station he is likely to have (commonly compensating .04 per degree of central angle) and then reduces it to a uniform grade per station. For example, we are running a 1 per cent. grade compensated .04 per degree. We judge we will have equal to a continuous 5 deg. curve, or a compensation of 0.2 per cent. per station, or equal to a straight 0.8 per cent. grade. Now make out a table of grades for 0.8 per cent. for the use of the transitman and levelman so they can tell just how they are for grade, whether the engineer is with them or not. Each night the line is platted up and a rough projection made, and the compensation figured to the end of the line and the trial grades corrected up. After the second day the topography is platted and the projection made more carefully and the grades re-checked and carried ahead to the end of line on rough projection. By this means the preliminary should be almost where the located line should run and the topography should cover the country desired.

As to the methods of field work on preliminary, there is really little difference among the general run of engineers. With the writer the transit notes are kept in the usual way, except that he always has the magnetic courses taken and recorded. It hardly ever checks with the angle, but if out over 1 deg. the angle is re-checked, and it will always save the transitman from making any serious errors in angle, though the writer has had men who made the same error in reading their angle and checking the course. The writer uses a hand level, or clinometer, and directs the head chainman, dodging obstacles as much as possible, and still keeping as near grade as can be done. In case of deep cuts, high trestles, or tunnels, follow grade around them, then run a line where the located line must go. This for the topography and for the reason previously given, to show why the line must go where it does.

The levels are kept up as closely as they can be, and the levelman leaves the elevation of stations and angle points for the topographer, usually on a stake, or piece of paper, every 400 or 500 ft. The writer tries to have the topography kept right up to the work so that the draftsman is only one day behind and the projection can be kept up.

When leaving the party to be gone over an hour the transitman is called to take the place of the engineer and the levelman runs the transit, for no man can run a party while standing behind a transit. In speaking of the levelman running transit, reference is made to the ideal party. The writer has had the rear chainman run transit and he did good work too, but some one must be ahead and some one must run transit. The principal thing is to get it done and done right.

Having the elevation of the station and angle points, the topographer, where he can, locates the 10-ft. contour above and below the line, and then takes the ground by slope measurement and distance, using a clinometer, measuring the distance with rod or tape where he can, estimating distance where he cannot measure. Besides entering these notes in his book, he also sketches in the general features of the line, showing stream and gulch crossings with their course or angle to the line, also character of the country, and any other information he can secure.

In reducing the topography to the map the writer uses a piece of celluloid about 6 in. x 12 in., out of which are cut slits running across, being about $\frac{1}{8}$ in. wide and $4\frac{1}{2}$ in. long, reaching to within $\frac{3}{4}$ in. of the edge. On the edge of these slits is marked 1-ft. contour intervals, with the 5-ft. x 10-ft. prominently shown, for each degree of slope up to 20 deg. Then by 5-ft. x 10-ft. contours and for each 2 or 3 deg. of slope up to 35 deg., then by 5 deg. intervals up to 60 deg. The one the writer uses is on a scale of 200 ft. to the inch and can be used for the 100 or 400-ft. maps by interpolating values. Any draftsman can use it at once and it is a very convenient labor saving device. The writer has not mentioned locating the contours on the ground and entering them in the book, as it is generally out of the question. The preliminary map is generally made on the 400-ft. scale, as it is most convenient, and on this is laid the trial location. Taking the table of grades worked out from the rough projection, step off 500 ft. with hair-spring dividers set as carefully as possible, following direction of the probable location and marking grade in pencil with a rivet pen, carrying these grades if possible for at least a mile of line. Now at a glance you have your grade line. Some men connect these points by a dotted line, but the writer has never found it necessary. Now try for the best line possible for the ground, as one should always try first for the best possible line, later trying to cheapen where it can be done, or, more truthfully, where it must be done.

For projection the writer uses thin celluloid curves, which he cuts out of a sheet of celluloid with a beam compass, as the manufactured ones are both bulky and expensive, and a dollar's worth of celluloid and a half-day's time will furnish a set.

The set the writer now has is for the curves he uses most, as,

like most locators, he has favorite curves whose deflections are easy to figure, and wherever they will fit the ground they are used. The set mentioned is for a scale of 400 ft., but they can be used for any scale by interpolating values. Whether to lay the tangent and fit in the curves, or lay the curves and connect by tangents depends on the ground. Commonly both methods are used on the same sheet. In either case the tangents are drawn to intersect the meridian on the map and the courses are taken by scaling tangent distances from the intersection of the meridian and taking the course from the table of natural tangents, in the same way you would plat from tangents. The courses are marked on the tangents and the angles computed by differences in courses.

The writer might remark here that all his maps are platted by latitude and departures, and in the office copy of the field notes the co-ordinates to each angle point are recorded. The transitman calculates the traverse of his line, being checked by the draftsman, or, on rainy days, by other members of the party. The angles on the map are roughly checked by a protractor. The projected tangents are scaled from apex to apex and the tangents for the curves are taken directly from Butts' Field Book. On each curve is marked degree of curve, central angle, semi-tangent and length of arc, and it is penciled in on the map. Now for stationing scale distance to P. C. of first curve, P. C. plus arc equals P. T. Then apex distance, minus semi-tangent of curves 1 and 2, equals tangent length between curves; P. T. plus tangent length equals P. C. of curve No. 2, and so on. Now use stepping dividers and lay off stations, checking by the P. C.'s and P. T.'s on line. While stepping line take off your trial profile; usually you see at a glance the line must be shifted, which you do at once, re-check your angles and stationing and continue till you get a line that looks about right. Now using your table of grades, lay a temporary grade line and make a preliminary estimate, using a table of cutting on transverse slopes. You will almost always find your line must now be shifted once more. In doing all this use a soft pencil with as fine a point as possible, and even then the map looks disgraceful, but it does not look any worse than you feel after you have worked over it awhile. When you have exhausted yourself and the map you are ready to run in the line, but the writer only calls for and uses it as a trial location not marking the stakes L, but any letter not previously used, and not running in nor using spirals.

This line as run in is platted in on the preliminary map, also on a new map of 200 ft. to the inch, and in very bad country 100 ft. to the inch. As the line is run in, co-ordinates are figured to the apex of each curve and ties are calculated and made to the preliminary at frequent intervals. The writer does not run tangents to intersection as he does not think the value equal to the work required, but depends on ties to the preliminary to take its place. On this work the writer has a small tracing showing a mile or so of the projected line and preliminary with the ties, showing some topography but not much. The writer carries in a book bag a thin board, 8 in. x 12 in., smoothed on one side, some thumb tacks, a small protractor which has been checked and known to be accurate, a small triangle, a 6-in. pocket scale in case, and a pair of pocket dividers, also some loose sheets of scratch paper tacked on the board. If the projected line does not fit, use this small drawing outfit and tracing and project a line that does fit.

Sometimes, but not often, the writer backs up, sometimes makes offsets. In fact what is done with the line depends on what can be shown by levels and topography. If to get them we must back up we do so, if not we go ahead. On this trial location the levels are checked with the preliminary, as are the courses of the transit lines. The topography is taken with as much care as possible and platted on the new map, but no effort is made to try and fit it to the preliminary map.

On the new map is now projected the revised location, using some of the methods used on the first projection, but with many modifications. This time instead of carrying the tangents to meridians and scaling them for the course, latitude and departures of the apex points are scaled from the meridian, entering the co-ordinates on a traverse sheet. From these is found the latitude and departures for each course and from these is worked out course and distances. In other words, it is the traverse of the projected line worked backwards, and by frequently using some course or apex of the trial location the work is checked and rarely is out more than 5 min. on courses. On the revision, spirals are calculated for all curves exceeding 3 deg., and unless on some road that insists on some other the writer always uses Talbot's, as it is the simplest and most flexible of all spirals. The writer also runs the spirals in on the revised locations, as it is the only way to secure the profile of the true line.

Some good engineers do not use spirals on location, leaving them for the construction parties, but the profile is incorrect and, of course, the estimate also. Besides, when left, it means an equation at the end of every curve, a thing every engineer abhors. Where there is an equation it should be carried to a tangent and then only marked on map and profile, short or long station, giving the length. If there is anything detestable it is to find a profile

marked $139 + 40 = 138 + 72$, and to the end of time one will wonder whether the man lost a station or found one.

The methods used in running in the revision are much the same as on the trial location. In running in curves in brush the writer uses long chords and offsets the stations. It means watching the chainmen to see that they hold off the correction. The table of long chords given in Shunk's Field Book are usually correct to within two-tenths up to 400 ft. for 6 deg. curves and it saves calculating them.

Some engineers object to offsetting stations on curves, but all the use you have for them in brush is for levels, topography and clearing, as the line must be re-run for cross-sectioning, and the man who cannot get them close enough for purposes mentioned had better try some other work. Personally, the writer has never felt called upon to slash the right-of-way to set a few stakes, and for that matter, many stakes must be left unset in the mountains, the best you can do, and left for the construction parties, who have both more time and ropes than the location parties. The writer has found, where there has been nothing to tie the lines to, that it is well to take an observation on polaris about every 10 or 15 miles. It corrects up the courses and catches an occasional error in courses that has slipped by. * * *

The amount of work that can be done by a party depends on the character of the country and the kind of line run. What might be a fair season's work expressed in miles in one locality would be poor in another. In 1903, from March to September inclusive, the writer ran 140 miles of preliminary at a total cost of \$10,500, an average of \$75 per mile. This included all expenses of every kind, including transportation for a full party and outfit from Bellingham, Wash., to Brewster, on the Columbia river, and the return of the party from Ruby creek, a branch of the Skagit, to Bellingham, besides the line run; but included in the cost was the building of 20 miles of trail by the party in the Cascades, a pack train, move of the camp and outfit 70 miles (requiring one week on account of rain and snow) to cover a gap four miles between the end of the trail being built and the one building to, as the four miles would have taken 30 men six weeks with a half ton of powder; also two months extra work of the writer and a draftsman completing all data in regard to the line. As a basis for comparing costs the following list of monthly salaries is given:

Transitman	\$90	4-horse team and driver, 2 mos.	
Draftsman	85	Includes feed for team and	
Level and topographer	75	board of driver	\$125
Rodman and head chainman ..	45	Pack train, 20 horses, 5 mos.	150
All other men, except cook	40	Packer, 5 mos.	75
Cook	75	Packer, helper.	50

The company shod horses in pack train and furnished feed when required.

In 1906 the writer re-ran a portion of the location of the Washington & Great Northern from Wenatchee to Oroville. The work was revision of location as covered in the description of projecting and running in such work. There cannot be given so close a statement on this, but the average was 25 miles of location per month at a cost of \$62 per mile; wages were about the same, as given above. These examples show how worthless, for purposes of comparison, tables purporting to give cost per mile of surveys can be, the preliminary of less than 100 miles costing much more than location. This would be shocking were it not that the same man did both, and both parties were equally good. As a further example, without going into details, the cost per mile of preliminary and location this season on Copper river, Alaska, will run over \$350 per mile, and in the Alaska work, on location, the average was eight miles per month, as against 25 on the Columbia and a pack train of four horses cost \$800 per month. The real basis of comparison should be for like work done under like circumstances, though that is hardly a possible condition.

DISCUSSION.

The following written discussion was offered by G. A. Kyle, Principal Assistant Engineer of the Chicago, Milwaukee & St. Paul Railway of Washington:

Regarding instruments, the older companies do not, as a rule, furnish as good instruments as smaller and newer companies, as their stock is generally antiquated. Perhaps there is some reason for their backwardness in this matter, owing to the fact that there is not enough attention paid to the care of instruments by the men using them.

The author's methods for running preliminary line on supported grade lines are very good, and the writer usually follows them quite closely, with the possible exception that in addition to taking needle readings the transitman always takes double sights with the transit, reversing the instrument for the second sight to average both the personal and the instrument's errors. This can usually be done without loss of time, especially in timber country when the speed of the party is determined by the ability of the axemen to clear the line; and the delay, if any, in clear country is more than counterbalanced by increased speed of the locating party in running out the projected location line on the ground, as

this added accuracy in preliminary line insures the close fitting of projection, and saves backing up, which is expensive and has a tendency to discourage the members of the party.

As to keeping close to the proper grade in running the preliminary line, the writer has often adopted the method of keeping the level party up close to the transit and setting the head chainman in timber country or head flagman in prairie country for the sight ahead with the level allowing for the grade at the point ahead where man is stationed. He has often kept the level notes himself, to enable the levelman to run the level in order to keep up close to transit; in fact, the transit was not allowed to get ahead of the levelman to any extent. The preliminary line can be run almost exactly to fit the grade, and the tangents almost in their proper place by keeping close track of curvature to be used on location.

Topography.—The writer prefers to locate the contours on the ground, whenever possible, with a hand level, and take actual measurements from the levelman with a chain or tape and plat same on sheets in the field. The topographer is allowed two men, one to run the hand level and the other the rod, both measuring the distance, measurements to be taken from each station each side of the center line to the first or second 10-ft. contour. At every 200 to 500 ft., depending on the character of the country, they take measurements to each 10-ft. contour to an elevation of say 100 ft. vertically in steep country, and take clinometer readings where the measurements leave off; in lighter country they take contours out from 500 to 1,000 ft. if necessary to locate some prominent point or object, all intermediate objects such as creeks, roads, etc., being noted, and the contours intermediate to the measurements can then be sketched in by the eye by looking at the shape of the ground. Wonderfully close work can be done by an experienced topographer, as with this system he has only to record the notes and sketch in the contours, and is relieved of the measurement by his assistants. At some points on the right-angle-lines he may take right angles to bring his line parallel with the main line, and measure along that to locate contours when irregular. In order to get a right-angle line to the center, he can use the board that is used to hold the topography sheets, mentioned below. The topographer sights one side of the board along the center line and the assistant sights along the end of the board, marking a tree or other object in the distance, or setting up a pole close to the center line for a sight to run to.

Whenever the line is running parallel with a water course the topographer should carry his levels down to the bottom of same every 1,000 or 1,500 ft., according to the character of bottom, in order that it may be shown on maps and profiles how far the line is above the bottom at any point. The topographer is always from one-half to one day's work behind the transit party by this method. Very good topography, however, can be taken by using a clinometer and one assistant to the topographer to measure the distances.

Topography Sheets and Maps.—The topography taken by hand level as above is plotted on sheets 12 in. x 18 in. to the same scale as the maps, which should be from 100 to 400 ft. per inch, according to the character of the country—easy country, 400 ft., mountainous country, 200 ft., very rough, steep slopes, 100 ft. per inch; but 200 ft. per inch is suitable for very rough steep country. The map should be broken where the scale changes, and the scale marked.

The line on the sheets should be plotted by the draftsman in the office and kept as near the center of the sheet as possible. The sheets should be marked so that they can be replaced in the same position they occupied when plotting the line so that the latter will be continuous on the sheets after the alinement is inked in. Each station should be marked on center line, and every even five or ten stations numbered. Light pencil lines should be drawn at right-angles to the center line at each station and parallel with the center line 100 ft. apart, dividing the paper into squares; then fasten the sheet or sheets on a board 12 in. x 18 in. x ½ in. with thumb tacks, and the topographer is ready to start.

He should note the distances out to all contours and objects such as roads, creeks, rivers, etc., on the edge of the sheet opposite the station where measurements are being taken, and plot the contours as measured with a scale or by the squares on the sheet and sketch in the contours, creeks, rivers, roads, etc., as nearly as possible between the measured points by looking at them on the ground. The topographer should ink the contours in the evening of each day's work (as he is more familiar with his own work than the draftsman) and turn the sheets over to the draftsman. The draftsman should plot the line separately on drawing paper and trace this on tracing cloth, then place the tracing over the sheets and trace the contours and topography shown on sheets. The draftsman should plot section ties on the sheet as well as on the maps. Each sheet should have the meridian shown on it, with magnetic variation shown. The writer has found that the topographer will take more interest in the topography when taken on sheets, as it is interesting to watch the development of the topography on the sheets; and after he gets the shape of the country started it is

wonderful how closely he can sketch in the intermediate points between measurements.

Maps should be made of uniform widths generally from 18 to 21 in. wide, as this is half the width of the general run of tracing cloth.

Projecting Line.—The author's method of projecting line is good, and is followed by the writer, except that he uses a continuous dotted line for the grade contour instead of a few circles, as one then has practically a profile of the line on the map. The fitting of the line to the grade contours is then purely mechanical, requiring no thinking to locate the grade contour, and all one's faculties can be concentrated on the balancing of quantities, and the line can be laid nearer the correct place quicker and easier.

Celluloid curves are useful when of large radius, but when the radius can be reached with an ordinary compass with extension joint, the writer prefers this, as the curves are worked from the contour, purely a mechanical instead of mathematical method of locating the limits of the curve. The more the work can be simplified the more time the engineer will have for the proper adjustment of the line. With good topography and careful work on line and maps, and in making projections, figuring quantities from projections and doing the backing upon the maps, the line should be located in the proper place the first time in ordinary country. In other words, the location should be done on the map and duplicated on the ground with proper precautions, and trial locations very seldom used.

Regarding the cost per mile of preliminary line, the author states that he ran 140 miles preliminary at a cost of \$75 per mile, and 25 miles at a cost of \$67 per mile, which is very cheap indeed, as the general cost of work west of the Cascades is a great deal more. In Alaska the writer ran 185 miles of location costing \$475 per mile and 600 miles of preliminary at a cost of \$238 per mile, the conditions being very severe.

New Mexican Central Organization.

In the former organization of the Mexican Central, the superintendent had charge of track and transportation. The superintendent of motive power had charge of the shops, of the care of locomotives and practically of the engineers, firemen and mechanics. There was also a material agent who had charge of material over the whole line, and a fuel agent who had charge of fuel over the whole line, and the responsibility was so scattered that it was hard to secure good results. Under the new organization the superintendent is responsible for everything on his division; the master mechanic reports to him, the transportation officers report to him and also the engineer of maintenance of way. The superintendent is responsible for his stock of materials, for his fuel and for everything on his division.

The superintendent of motive power has immediate charge of the general shops of the company at Aguascalientes, but, so far as the other shops are concerned, he exercises only the supervision to secure uniformity of work and the maintenance of established standards. He is not responsible for discipline or the handling of the shops in any other way. The supervision of the chief engineer over the line is similarly restricted to seeing that standards are maintained and that engineering work generally is along the line of adopted practice. President Felton, to whom we are indebted for these details, describes the organization as being practically that of the Pennsylvania Railroad, modified to suit local conditions; that is to say, it is strongly divisional, whereas formerly it was departmental. In spite of the obvious fact that a railroad system cannot expect to find one man who is of really first-class value in all lines, mechanical, engineering and operating, most railroads in this country are getting better results from a strong divisional organization with what may be termed departmental staff officers, reporting to the president or

general manager, than they are from a strictly departmental organization, and the Mexican Central is doubtless wise in making the change.

Walter G. Berg.

Walter G. Berg, Chief Engineer of the Lehigh Valley, died suddenly on May 12, of acute indigestion, at his home in New York. Mr. Berg had the unusual combination of executive ability and breadth of view, with the faculty of closest attention to details. After designing a yard he could tell the operating officers how to use it. Yet this ability to understand all phases of a problem was not lessened by his habit of working out with his subordinates the minutest details of any design; a habit which destroys the perspective of most men who practice it. In making a report on a subject, he analyzed it exhaustively, and during the later years of his connection with the Lehigh Valley he was constantly called on by other companies and individuals to pass on plans and otherwise act as consulting engineer.

He was born in New York on January 12, 1858, and was educated in that city and in France and Germany. He took his C.E. degree at the Royal Polytechnic Institute at Stuttgart in 1878.

During his course he won a gold medal for a treatise on Spherical Conic Sections; the only time an American has won that medal. He then returned to this country, and for a year was shop inspector of the Delaware Bridge Co., at New York. He was then, for four years, in the engineering departments of the Richmond & Allegheny, now part of the Chesapeake & Ohio, and the East Tennessee, Virginia & Georgia, later taken over by the Southern. In 1883 he went to the Lehigh Valley as Assistant Engineer. He was in charge of some railroad construction, and also designed and built round-houses and other structures at Packerton, Pa., and various other points on the Lehigh division. He built the company's creosoting plant, and for a time was Superintendent in charge of it. In 1887 he was appointed Principal Assistant Engineer. In this year he designed and built the Jersey City Terminals of the road. This work was an example of his originality in design, being perhaps the first use in that locality of wooden transfer bridges, while the layout of the piers was also novel. Throughout his service he was always on the lookout for the latest ideas, keeping closely in touch with current practice all over the country. The idea of the circular freight yard built for the Harlem Transfer Company originated with him, when he was consulting engineer for this work, and the design has since been used at various points on the Lehigh Valley.

In 1898 he was made Engineer of Maintenance of Way, and in 1900, Chief Engineer. The Sayre shops were designed and built by him in 1903. Mr. Berg was a member of the American Society of Civil Engineers and many other engineering and railroad associations, being at one time President of the Association of Railway Superintendents of Bridges and Buildings, and at the time of his death President of the American Railway Engineering and Maintenance of Way Association. He was the author of Buildings and Structures of American Railroads, American Railway Bridges and Buildings, Strength of Timber, and American Railway Shop Systems.

Among the British possessions in South Africa is a territory extending along the west side of Lake Nyassa, the east side of which is the western border of German East Africa and Portuguese Mozambique, and extending from the southern end of Nyassa southward about 170 miles, and 90 miles from east to west, directly into the Portuguese territory. The importance of this is that it contains the valley of the Shire river, which runs from Lake Nyassa to the great Zambesi river, and for part of its course is navigable. For 100 miles of the unnavigable part of this river, Port Herald north to Blantyre, a railroad has been built, the northern part of



Walter G. Berg.

which, to Blantyre, was opened March 31 last. Lake Nyassa is about 360 miles long from north to south, so that the railroad will give an outlet to a large territory adjacent to navigable waters. The Germans are building a railroad from the sea westward towards the north end of Lake Nyassa, but it will be several years before it reaches the lake.

Railway Signal Association.

The regular May meeting of this association was held at the Engineering Societies' building, West 39th street, New York City, on Tuesday of this week, with President A. H. Rudd (P. R. R.) in the chair. About 150 members were present at both the morning and afternoon sessions.

President Rudd said that in the six months since the annual meeting the committees had done more work than ever before in a similar length of time, and the chief feature of the meeting was the accounts given of what had been done by the principal committees. Mr. Patenall (B. & O.), speaking for Committee No. 1, said that progress had been made toward standardizing colored glasses. A sub-committee had met the manufacturers and had decided on methods of testing. It is proposed to adopt a standard photometer. Specifications for standard glass have been drafted and are now in the hands of signal engineers and manufacturers for criticism. Mr. Mock, reporting for another sub-committee of Committee No. 1, said that some progress had been made toward agreement on standards of signal construction. Agreement has been reached, or nearly reached, on signal posts, ladders and stays; and progress made toward the adoption of uniform specifications for 1 in. pipe and pipe couplings, cranks and pins. A standard semaphore casting has been discussed, but further progress must wait for the association to settle upon what aspects it will approve. Mr. Kelloway (A. C. L.) reported that his sub-committee had agreed on rules for the protection of drawbridges and had made progress on standard specifications for bolt locking, for circuits for interlocking, and for lamps.

Mr. Mann (Mo. P.), for Committee No. 3, on standard specifications for electric interlocking, presented a printed report embodying additions or modifications proposed by the committee. The changes proposed are the result of conferences between the committee and representatives of seven prominent manufacturers of electric signal material. This report was discussed by the meeting at length, especially those parts relating to gas engines, generators and storage batteries. The meeting resolved itself into a Committee of the Whole and gave Mr. Mann numerous suggestions for improving his recommendations for presentation to the annual meeting. Messrs. Stevens (A., T. & S. F.), Elliott (N. Y. C. & H. R.), Denny (L. S. & M. S.) and others gave their views as to the proper size of the gasoline engine as related to the capacity of the electric generator. Mr. Stevens believes that experience will show that for isolated electric interlocking plants a storage battery of 80 amp. hours or larger will be more economical than one of 40 amp. hours, which is the size now most commonly used.

The committee recommended that the electric generator for an interlocking plant should be at least large enough to operate two switches simultaneously; this to provide for the emergency of the storage battery being disabled. It was thought by some that this emergency was too remote to need consideration, but a motion to expunge the paragraph was voted down.

It was the sense of the meeting that storage battery cells should be arranged on the racks transversely instead of longitudinally, as is the practice among users of the storage battery in other than signal work.

In the discussion of bonding of rails, it was stated that copper clad wire is now being used experimentally by a number of roads for this purpose.

The first thing done at the afternoon session was to listen to a paper on the care of storage batteries, by H. M. Beck. The speaker dealt chiefly with the restoration of low cells. He said in part:

The care of a storage battery should have for its object the prevention of low cells, rather than their treatment. The most economical method is to make the expenditure required for the proper care and operation of the cells and this is absolutely essential, if satisfactory results are to be obtained. The tendency is just the reverse: to allow the cells to run as long as possible with little or no attention, and it has frequently required a costly experience to bring about the needed reforms.

While the causes of low cells may be varied, the result produced and consequently the treatment required, is not so varied, being in fact, comparatively simple. The general procedure is as follows:—

1. Restore the cell mechanically.
2. Renew the electrolyte if there is any question as to its purity.
3. Restore the cell electrically by charging.
4. Determine, if possible, the cause of the trouble.

The mechanical restoration covers the operation of examining the cell and putting it back into its original condition mechanically.

If the electrolyte were renewed in every case the expense would not be great in the small cells used in signal service and this operation would then be purely mechanical.

The electrical restoration has been probably the greatest stumbling block, but it consists in simply charging the cell until a maximum voltage and gravity is reached.

The determination of the cause of the trouble is sometimes difficult, but fortunately it is not one of the essentials, and is chiefly of value in preventing a recurrence of the trouble.

Thus reduced to its essential elements, the treatment of low cells consists simply of a mechanical overhauling followed by a prolonged charge, and should not be difficult for anyone to grasp.

Mr. Beck then gave a very thorough, detailed and clear statement of the troubles encountered in the management of accumulators, due to short circuits, sediment, worn plates, lack of care, impurities in the electrolyte, sulphating, lack of ventilation, and every other possible cause, and told in simple and forcible language how to deal with each; and closed as he began, with the three essential points: Restore the cell mechanically, renew the electrolyte if its purity is questioned, charge to a maximum. In many cases the storing charge is all that will be found necessary.

There was no discussion on this paper, the general opinion being that the author had treated his subject exhaustively. Following this, Mr. Yocum (P. & R.), for the committee on storage batteries, presented a printed report consisting of a carefully prepared and detailed description of the storage battery, with rules for installation and care. One of the rules proposed was that every two weeks storage batteries should be overcharged for about one hour. This provoked discussion, as some batteries in places not conveniently reached and not much used are overcharged far less frequently than this. Mr. Stevens (A., T. & S. F.) overcharges his batteries every sixth charge, no attention being paid to the number of weeks elapsed. The prevailing opinion was that a rule like this—for overcharging on one of a given number of occasions—would be satisfactory, and that a time limit was not necessary.

Mr. Ames (N. Y. C. & H. R.), for the committee on rubber covered wire, reported that his committee had been divided into sub-committees and that certain changes in the specifications had been drafted. The committee is going to give hearings to the wire makers. A report on copper clad wire has been drafted.

At the afternoon session the secretary announced the sudden death of Walter G. Berg, President of the American Railway Engineering and Maintenance of Way Association, and the meeting passed resolutions of sorrow and esteem and sent a message of sympathy to Mr. Berg's family.

Block Signaling Under the Supervision of the Train Despatcher.*

The A. B. C. Rules on the Northern Pacific have passed the experimental stage. Their value is no longer a matter of speculation. Apparently they have come to stay. They are, without doubt, superior to any single track system of rules and orders yet devised. They are now used on 63 miles of track, from Spokane to Ritzville. On this territory there are 15 telegraph offices and three blind sidings. It is all main line and handles a traffic so heavy that with the ordinary system of train orders it was found impossible to keep trains moving.

With the A. B. C. system no train orders are issued and there are no time-table schedules except for information to the public that passenger trains may be expected at certain times. A train obtaining a clear signal at a telegraph office and obtaining a clearance card from the operator has absolute right to the next telegraph station. There it receives further instruction by means of a three-position semaphore either to stop and wait, to take siding or to proceed to the next station. Clearance cards are delivered to conductor and engine man by means of hoops and no reduction of speed is necessary.

Four months' experience has shown surprisingly satisfactory results. It is difficult to arrive at an exact statement of increase of efficiency, but a comparison of statistics for one month with that of the corresponding period a year previous shows that the average speed of all freight trains in passing over this portion of the track was 11 miles an hour, as compared with 8.6 miles an hour the previous year. This includes all delays and also includes the movement of two way freights. Omitting the locals the record shows an average of 14 miles an hour. * * * The success of the venture is attributed to the hearty co-operation of the despatchers, trainmen and operators.

With the A. B. C. system three men must act simultaneously with each other. No move can be authorized and no signal can be cleared unless the three give their consent. The operator who is to clear the train first examines his own block record, and if the track is clear asks the despatcher for a clearance. The despatcher looks at his train sheet and if found proper issues the necessary authority. The operator then asks permission of the operator at the next station to admit the train to the block. If the latter is satisfied that the track is clear he gives his consent. The duties of each man are so simple, compared with the handling of a hundred or more train orders every day, that from the mere standpoint of clearing the atmosphere surrounding these men the system must recommend itself.

*By H. A. Dalby, in the *Firemen's Magazine*.

Erie Terminal Improvements in Jersey City.

The improvements which are now being carried out by the Erie Railroad at its terminals in Jersey City have in view two principal objects. An ingenious rearrangement of tracks provides for complete separation of freight and passenger business and for the movement of passenger trains to and from the several branches without interference with each other. The plans have been under consideration of the executive and engineering departments for nine years

increasingly the difficulties of the situation and delays have been frequent. To relieve this congestion a four-track open cut is being made through Bergen hill, on the completion of which its four tracks will be used by passenger trains exclusively and the present tunnel will be used by freight trains only.

Passenger traffic, largely suburban, comes from six different Erie lines. These are the main line, New Jersey & New York Railroad, Northern Railroad of New Jersey, New York & Greenwood Lake, Newark branch and New York, Susquehanna & Western, and are shown in the plan on page 670. The New York, Susquehanna & Western now uses, for passenger traffic, the Pennsylvania station in Jersey City.

At some distance west of Bergen hill these six lines converge into three main stems, each carrying the traffic of two branches. These are known as the Main line, the Newark branch and the Susquehanna line. The New Jersey & New York joins the main line 5.5 miles from the west end of the open cut. At a point 2.4 miles west, the Newark branch and Greenwood Lake lines meet. The union of the New York, Susquehanna & Western with the Northern of New Jersey is to be three miles west of the cut.

All lines of traffic therefore now converge at the west end of the Bergen tunnel. The handling of trains involves cross-overs which necessarily cause interference with trains moving in the same direction, and particularly with trains moving in opposite directions. All tracks are on the same grade. This interference will be avoided by a new track lay-out which will obviate, by means of an arrangement known as a "flying junction," all interference between trains. By this arrangement the direction of traffic on the four tracks through the open cut may be varied to suit. It is proposed, during the

morning hours, to assign a separate track to inbound trains from each of the three main stems, leaving the fourth track to handle the outbound traffic. In the evening, this arrangement will be reversed. In the middle of the day the normal distribution will be two tracks for inbound and two for outbound service.

The four tracks emerging from the open cut will, as shown on the map, pass under the four tracks of the Lackawanna and under Tonnele avenue. At this point they will diverge into six tracks, two for each group of lines, one inbound and one outbound. One arrangement of the switches will provide for all inbound movements in the morning and another for all outbound movements in the evening. Having set the switches for such movements the oper-



West Approach, Lackawanna and Erie Tunnels.

and are now fully worked out and with a view to probable electrification in the near future. Though they involve operations of great magnitude, they are being executed without delay on account of the prevailing financial depression.

The work now under way naturally divides itself into two sections: The separation of the passenger and freight business and the segregation of the trains from and to the several branches.

All passengers and all freight destined for or originating at Jersey City or New York must now be taken through a double-track tunnel about 4,400 ft. long. The traffic is so great as to occupy both tracks almost continually during the whole 24 hours. The requirements of the road's large suburban business, especially



View of Open Cut from Hudson County Boulevard; Erie Terminal Improvements.

during the rush hours of morning and evening, have seriously hampered the freight business. It has been the custom during morning hours to use both tracks for inbound movement and for a period of about two hours to allow no westbound movement of any kind. In the evening inbound passenger trains are run in this way. In order to increase the capacity of the tunnel some trains with two locomotives are sent out as one. These are separated beyond the tunnel without serious delay.

But the increasing suburban and freight traffic has aggravated

ator is thereafter concerned only with handling light traffic to or from the proper lines.

The tracks of the Susquehanna line, both eastbound and westbound, rise together from Tonnele avenue on a 1.15 per cent. grade on an embankment and by an overhead bridge across the westbound main line and westbound Newark branch. This line will continue on a viaduct over all the yard and freight tracks. The two tracks continue together thence to the point of separation of the Susquehanna and Northern of New Jersey lines. This will make it pos-

sible for the New York, Susquehanna & Western to use Erie terminal instead of the Pennsylvania terminal, as at present.

Of the main line tracks, the westbound track passes under the passenger and freight tracks of the Susquehanna line, and the eastbound track passes under the freight tracks of the Susquehanna. Thence both tracks rise on separate embankments and continue together and parallel on a bridge over the westbound Newark branch and the Newark branch freight connection. The two tracks then



Cable Conveyors for Handling Excavated Material.

Location of present tunnel shown by ventilator.

descend on an embankment and run parallel to the point of divergence of the main line and the New Jersey & New York.

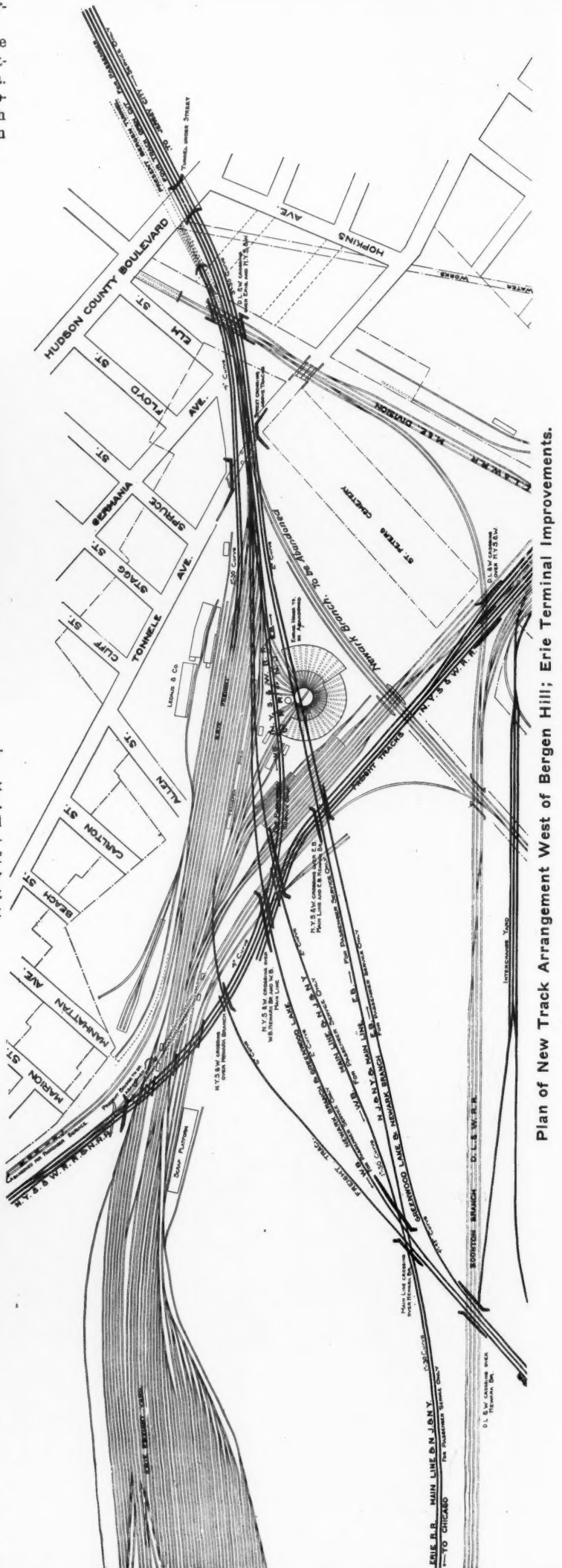
The location of the Newark branch line and of the New York & Greenwood Lake line and their point of divergence will be changed. These lines now leave the main line just west of the tunnel and cross the Hackensack river, whence the Newark branch runs westerly, while the New York & Greenwood Lake follows the bend of the river and proceeds northwesterly. The old line of the New York & Greenwood Lake originally crossed the river at a point higher up. Under the rearrangement the tracks of the Newark



Anchor for Cable Conveyor.

branch and the New York & Greenwood Lake will be the same and will follow the old location of the latter road crossing the Hackensack river near Snake Hill on a new bridge now being built. The two lines will diverge just west of the bridge.

The westbound track of this line will pass under the freight and passenger tracks of the Susquehanna line and under the main line tracks. The eastbound track will pass under the Susquehanna freight tracks, joining the westbound and freight tracks of the Newark branch. All three will pass under the Boonton branch of

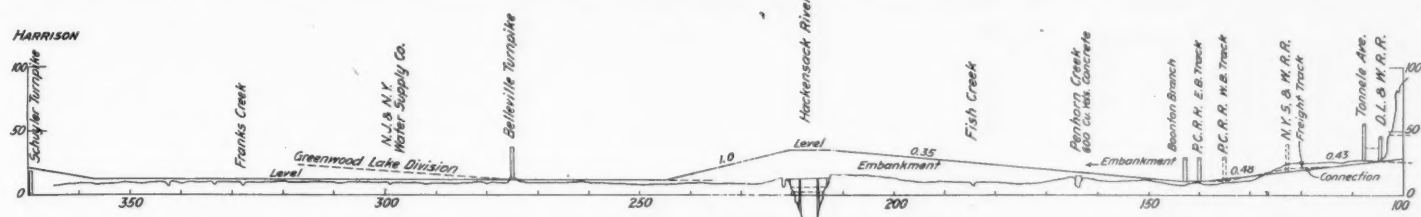


Plan of New Track Arrangement West of Bergen Hill; Erie Terminal Improvements.

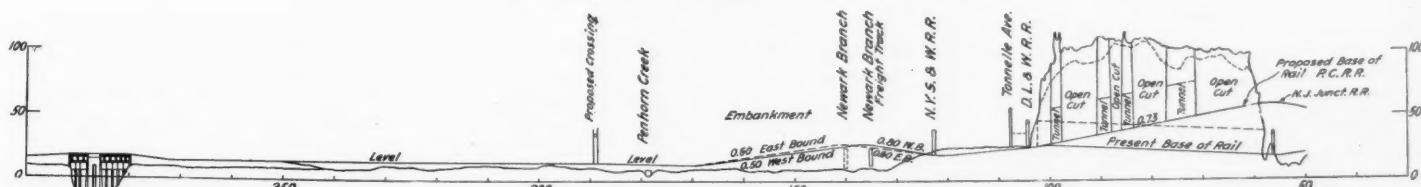
the Lackawanna, and by a long curve reach the point of crossing the Hackensack. This rearrangement work is in progress to the extent that the necessary embankments are being built of the material taken from the open-cut excavation. There is required construction of 8.4 miles of new double-track line and partial abandonment of 8.7 miles of existing double-track line, most of which can be used in freight service. Just west of Bergen hill are the Hackensack

spans, some 78 ft. and some 79 ft. long, and a draw span of 264 ft., making a total length between abutment backwall faces of 736 ft. The abutments and piers are concrete on pile foundations. The contractors for the substructure are McMullen & McDermott, New York; the superstructure will be fabricated and erected by the American Bridge Company.

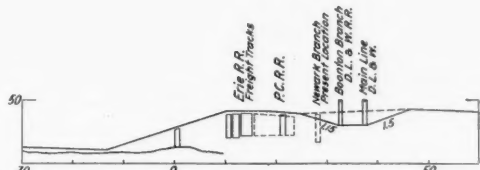
The new line through the cut follows the general direction of



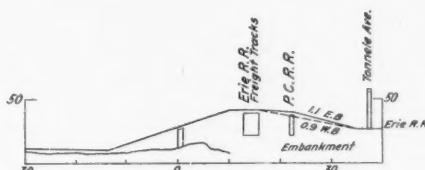
Newark Branch and Greenwood Lake Division.



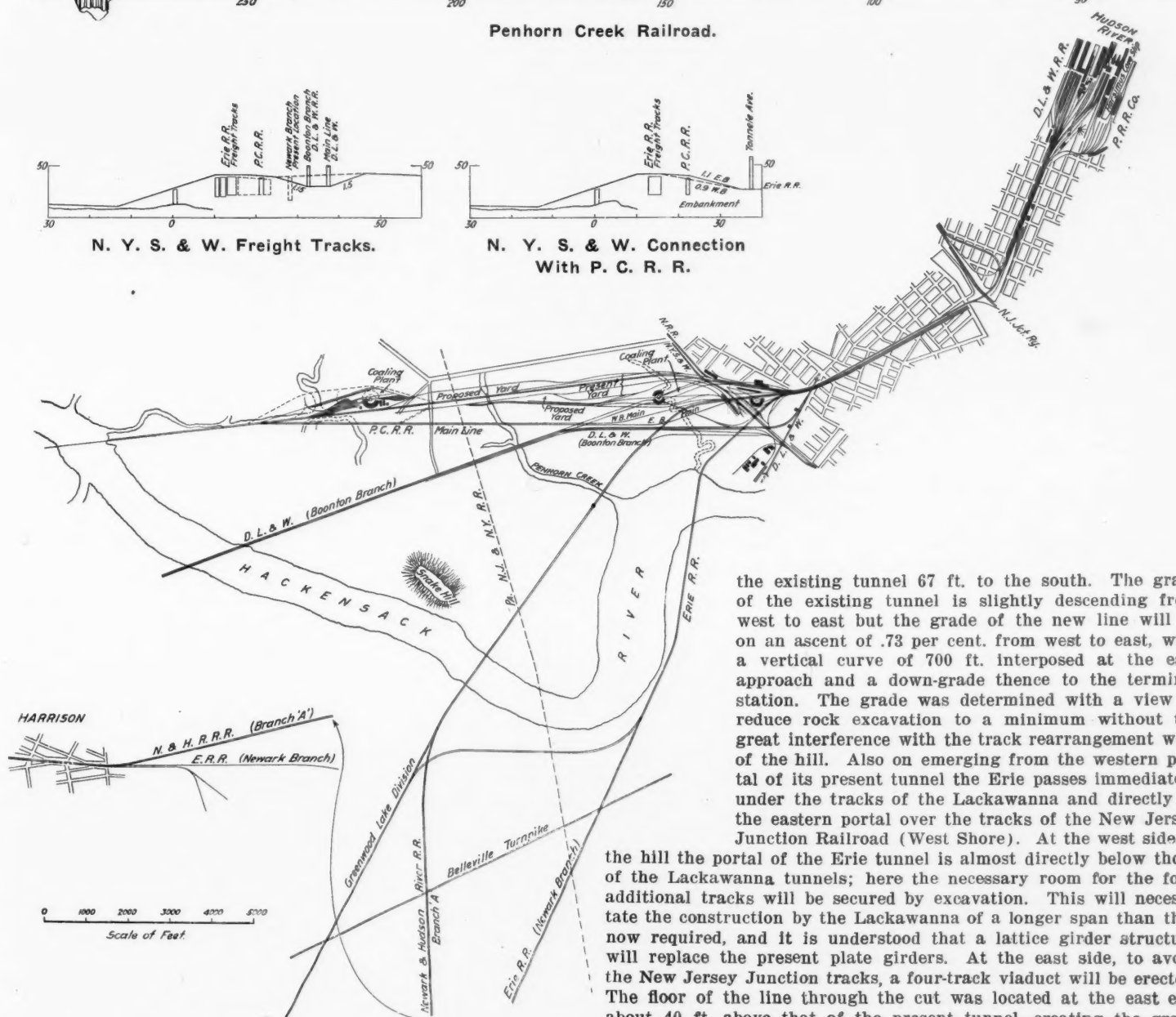
Penhorn Creek Railroad.



N. Y. S. & W. Freight Tracks.



N. Y. S. & W. Connection With P. C. R. R.



General Plan of Bergen Hill Cut and Proposed Track Arrangement; Erie Terminal Improvements.

meadows, where the necessary embankments will require some 530,000 cu. yds. of material, much of which will come from the open cut excavation.

The foundations of the new bridge across the Hackensack river is under way, and it is expected that the steel work will be placed this summer. This bridge will consist of six plate girder deck

the existing tunnel 67 ft. to the south. The grade of the existing tunnel is slightly descending from west to east but the grade of the new line will be on an ascent of .73 per cent. from west to east, with a vertical curve of 700 ft. interposed at the east approach and a down-grade thence to the terminal station. The grade was determined with a view to reduce rock excavation to a minimum without too great interference with the track rearrangement west of the hill. Also on emerging from the western portal of its present tunnel the Erie passes immediately under the tracks of the Lackawanna and directly at the eastern portal over the tracks of the New Jersey Junction Railroad (West Shore). At the west side of the hill the portal of the Erie tunnel is almost directly below those of the Lackawanna tunnels; here the necessary room for the four additional tracks will be secured by excavation. This will necessitate the construction by the Lackawanna of a longer span than that now required, and it is understood that a lattice girder structure will replace the present plate girders. At the east side, to avoid the New Jersey Junction tracks, a four-track viaduct will be erected. The floor of the line through the cut was located at the east end about 40 ft. above that of the present tunnel, creating the grade previously referred to. The situation at the west portal of the tunnel is shown in one of the accompanying photographs.

The cut will be 60 ft. wide at the base and about 100 ft. at the top. The section of the cut at the west entrance will be 275 ft.; the next three in order are 700, 190 and 670 ft. respectively; while the east approach, from east of Palisade avenue to the first tunnel is 1,300 ft.; a total length of open cut of 3,135 ft. The whole length of the opening, however, is nearly 4,400 ft., for, though known as an open cut, the opening through the hill includes four

tunnels aggregating 1,310 ft., as follows: Under Hudson county boulevard, 190 ft.; under St. Paul's avenue and Bevan street, 285 ft.; under Summit avenue, 255 ft.; under Hoboken and Central avenues and intervening property, 580 ft. At the intersection of St. Paul's avenue and Bevan street it was originally planned to build bridges, but it was finally concluded that the tunnel construction would involve less difficulty than bridges at an intersection.

The proportions of material involved in the excavation are about: Rock, $4\frac{1}{2}$; earth, 1, the total estimated quantities being 113,890 cu. yds. earth excavation, and 498,550 cu. yds. rock, of which 79,050 cu. yds. are included in the four tunnels. The contract for the work is held by the Millard Construction Company, of Philadelphia.

The work has been made harder because part of the site of the cut was formerly residence property, and it has been necessary to keep streets open and unobstructed by even a contractor's transportation line. Certain parts of the work, also, are crossed by street railway lines. On account of the need for material for embankments west of the hill and the general nature of the location, it has been necessary to carry most of the excavated material for some distance in that direction, avoiding at the same time Hudson county boulevard, a busy thoroughfare, and the network of tracks on various levels at the west end.

One of the views herewith shows the excavation as it appears looking east from Hudson county boulevard. To avoid crossing this street, the narrow gage line shown is carried through a tunnel under the street and leads thence west to a stone-crushing plant near Tonnele avenue. Another line is carried on a trestle of wooden truss and plate girder spans over the Lackawanna tracks, thence out to the embankments on the meadows, about $1\frac{1}{2}$ miles.

In removing material from the cut the apparatus of the Balanced Cable Crane Company, New York, is used. The cables are supported from heavily counter-weighted shear legs on each side of the cut and from the conveyors the material is dumped into the cars on the track at the south side of the cut. One of the conveyors and one of the anchors for the conveyor line are shown herewith.

The crusher plant comprises one No. 10 and four No. 6 crusher. A belt conveyor carries the crushed stone to a point where it will be stored until required for use in tunnel linings and portals. The power and lighting plant of the contractors is at the same location. The main power plant includes an Atlas boiler and engine of 2,000 h.p. capacity for the crusher plant, and three Laidlaw-Dunn-Gordon compressors which supply power for about 65 drills. A generator forming a part of the same plant supplies current for lighting and for the operation of the conveyors.

This terminal improvement work has been under the general supervision of J. M. Graham, Vice-President of the engineering department, assisted by F. L. Stuart, Chief Engineer. Immediate supervision has been in charge of G. H. Burgess, formerly Engineer of Terminal Improvements, now Principal Assistant Engineer, assisted by A. L. Moorehead, Resident Engineer at Jersey City.

Railroad Regulation.*

BY ROBERT MATHER,
President of the Rock Island Company.

It is not because of the extent of Pittsburgh's commerce, vast as it is, nor because of its historic associations, absorbing as they are, that a discussion here of the subject of railroad regulation peculiarly appeals to me. It is rather because here, where a greater tonnage moves than anywhere else in the country, there is less of controversy between shipper and carrier than anywhere else in the land. I am told that here, in the country's nerve-center of traffic, out of all the multiplied millions of transactions between merchants and railroads, there has never been found a cause of complaint to present to the Interstate Commerce Commission. This does not mean that the railroads have never been wrong, or unreasonable, or exacting, or inefficient, or that the shipper has never demanded what he ought not to have received. I have no doubt that, in the weakness of human nature, many of these things, on both sides, have occurred. But there has been found a way in Pittsburgh to move an unparalleled tonnage in spite of all such discouragements and conflicts, with satisfaction to both shipper and carrier and without the intervention of courts or commissions. I hold that fact to be of great significance in these days of clamor for increased regulation of the business of transportation, and I deem it worthy of our serious thought.

I appreciate fully that, in this respect, no miracle has been wrought in Pittsburgh. I yield to you gentlemen of the Traffic Club high praise for the achievement I am extolling, but I still believe you to be an ordinary lot of men, uninspired except by the spirit of good sense. I understand that you proceed upon the very human and rational theory that the interests of producer, transporter and

consumer are alike and mutually dependent; that without production there can be no transportation; and that unless the combined efforts of producer and transporter can lay down your product before the consumer upon a basis that the consumer can afford, your commercial activities are doomed to failure. So when you find that a consumer or a community that in view of all other commercial conditions ought to be taking your product, is not taking it, you look for the cause in the rates or practices of the railroad that carries your product to that place. If you find that a change in rates will secure the customer or the community, or that an improvement in train service or some addition to the carrier's facilities will move the traffic, instead of filing a complaint in Washington, you go to the railroads direct and ask them to help you, and at the same time to help themselves, by making the change that will produce the result. And so willingly have the railroads met and co-operated with you that, in the working out of the myriads of such problems that your teeming commerce has presented, you have not yet been denied a request the denial of which could give you ground for legal complaint.

I believe that this Pittsburgh plan of conference and co-operation between railroads and shippers should be given wider scope before we become finally wedded to the alternative plan of governmental compulsion. What you have done in conducting your manifold and stupendous dealings with the railroads, not only without clamor for additional restrictive laws against them, but without even invoking such laws as exist, can and ought to be done elsewhere. More than this, not only the carrier and the shipper, but the representatives of the regulating power of the government should meet on this platform of mutual confidence and co-operation. It is perfectly feasible in every commercial center like Pittsburgh for the railroad traffic associations to hold open meetings with the representatives of the shippers, to make up their docket of subjects to be acted upon not only from the requests of their members, but from the suggestions of their customers, and to place the docket in the hands of all entitled to attend a reasonable time in advance of the meeting. It is further not only practical, but in my judgment highly desirable that a member or a representative of the Interstate Commerce Commission should not only attend those meetings, but even preside over their deliberations and umpire their disputes, with possibly some provision for appeal to the Commission itself. Thus would we revert to the example of Washington when he and the colonial commissioners met in peace and not in strife to solve by mutual helpfulness the national problem of transportation. And thus the regulating power would get at first hand and through touch with the vital facts, its knowledge of the complicated commercial and social conditions which every contested rate question presents. It would be dealing with the parties at a time when, with open minds, both are striving to reach a point of mutual advantage, rather than when, as opposing parties to a complaint, each is trying to get the better of the other. Under such a plan of co-operation, perfectly consonant with provisions of existing law, the regulating power would become, as it ought to be, an instrument of conciliation, and the fruit of its exercise would be commercial peace. Through such an agency the difficulties in the way of uniform classification would be removed, a national and harmonious system of rates established, mystery taken out of traffic problems, and the path made smooth to the day when a stamp purchased from any carrier and affixed to a parcel of merchandise will carry the parcel to its destination, wherever it may be, as surely and unostentatiously as the postage stamp now performs its lowly task. I believe the railroads would welcome and support such a scheme of co-operative regulation of their rates and their traffic.

I fear that the public but dimly realize the willingness of the railroads to accept and to further the reforms in transportation methods that recent changes in our laws and in their administration have produced. The effective prohibition of rebates and of free transportation, and the elimination of the many forms of discriminations which expressed the subservience of the carriers to the large shippers mark the emancipation of the railroads from a slavery to abuses to which none of them would return. Most of them are not only willing but anxious to co-operate in any policy of reasonable regulation that will maintain their business on the higher plane of morality to which it has thus been forcibly lifted. And I think that spirit of co-operation should be reciprocated by the regulating power.

It continues, however, to be the claim of the railroads that they shall not be so regulated as to be prevented from earning interest on their bonds and reasonable dividends on their stocks. And they insist that not only they and their security-holders and their employees, but the nation at large is interested in their continuing ability to earn those charges and dividends. For, in the absence of such earnings, their securities become discredited, they are in consequence unable to provide the added mileage and increased facilities which the growing commerce of the country demands, and thus they fail to support not only their own normal quota of employees, but millions of others of our citizens who depend upon the many industries that the ordinary activities of our railroads

*From an address before the Traffic Club of Pittsburgh, April 3, 1908.

keep in operation. The dark days through which we are passing lend telling weight to this contention.

The insistence of the railroads upon this position involves no criticism of the policies of the President. Indeed, he admits that the railroads should earn their interest and charges, and concedes that, generally speaking, they are not over-capitalized. His policies, however, do not concern themselves, *primarily*, with the conservation of the revenues of the railroads. I understand his attitude in this respect to be expressed in the Scriptural injunction: "Seek ye first the Kingdom of God and his righteousness; and all these things shall be added unto you." The practice of the railroads in the past, it must be confessed, has been to reverse the order of this text; to seek first their revenues, and to await with patience the coming of the Kingdom of God. It is not surprising, therefore, that they take hold of the first part of the program of this new dispensation not only with awkwardness, but with some fear that the promise of the latter part may not be realized. It is a fact, however, that the first enforced steps taken by the railroads on the path of righteousness marked out for them by President Roosevelt have tended to increase rather than to diminish their revenues. The limitation of the pass privilege has clearly swollen the passenger receipts. The enforcement of the prohibition of rebates has not only turned our traffic men—and the traffic men of the shippers, too—from a life of daily crime, but has turned money into our treasuries. So clearly is this true that the chief political opponent of the President makes it his daily taunt that the only regulations the administration has actually enforced against the railroads have added to their revenues—as though that in itself were a crime to make the blood of the people boil.

But the statesmanship that rises no higher in its treatment of this great question than to see good in no regulation save that which takes money from the railroads, either lacks intelligence itself or assumes want of intelligence in the electorate to which it appeals. And I believe that the people could be led to see the essential identity of the prosperity of the country with that of the railroads, and the absolute dependence of the one upon the other, if only a voice could be found to raise that cry.

A program of rational regulation should oppose the regulation of railroad rates through the specious device of a physical valuation of railroad properties. The argument in favor of this suggestion is founded on the assertion that railroad rates are unreasonably high. If, it is argued, a value could be placed by governmental determination upon the physical properties owned by the railroads, that valuation would express the aggregate investment on which the earnings of the roads should yield a fair return, no matter what amount of outstanding securities represent the properties or what those securities cost to original or present holders. Wholesale reduction of rates could then be made to a basis just sufficient to yield this reduced return.

The premise of this argument is false and its conclusion immoral.

Railroad rates in this country are not unreasonably high. As shippers and consumers of freight we pay a transportation cost less than one-half that of Germany, barely more than one-third that of France, and but slightly in excess of one-fourth that of England and the other countries of Europe. Following are the figures for last year:

Country.	Freight cost, per ton mile, in cents.	Country.	Freight cost, per ton mile, in cents.
China .....	.10	Germany .....	.015
Japan .....	.05	France .....	.019
Russia .....	.022	England .....	.026
Italy .....	.024	United States .....	.0069
Austria .....	.0225		

Besides, the cost of transportation to the actual consumer is so slight a quantity as never to disturb his thoughts except when forced upon his attention as a campaign issue. A careful writer has computed the amount which freight charges actually add to the cost at Pittsburgh of necessary articles of wear and consumption, and I give you some of them:

A suit of clothes—three cents;
A pair of shoes—one and one-half cents;
A man's hat—less than half a cent;
A lady's hat, trimmed for wear—less than one cent;
Muslin—one-twelfth of a cent per yard;
Flour—less than one-fifth of a cent per pound;
Dressed meats—one-fourth of a cent per pound;
Fish—one-third of a cent per pound;
Vegetables and canned goods—one-sixth of a cent per pound.

We "plead the baby act" as a nation when we cry out against the alleged over-capitalization of our railroad corporations. The state and the nation had their opportunity, at the time of issue, to prevent the sale and consequent validation of these "watered" securities. Why was their issue not prevented? Because, as a people, we were willing to pay the price and to take the chance, in order to get the railroads built and the country developed. Well, the railroads were built and the country was developed because, by reason of this attitude of the people, the states and the nation,

it was possible to sell the securities thus issued in the world's markets, and, through their sale, to obtain the money without which the railroads would not have been built and the country would not have been developed. In countless cases, under all sorts of circumstances, it has been attempted to invalidate railroad bonds on the claim that the corporation got inadequate consideration for their issue—that is, that they were issued in excess of the value of the property of the corporation. Against every such attempt our courts have held, with a unanimity that attests the essential righteousness of the holding, that all such securities, no matter how flagrantly over-issued, in the hands of holders for value are the enforceable obligations of the corporation and valid charges upon its properties and their earnings. The movement for a physical valuation of railroad properties seeks to accomplish, by administrative order, the invalidation of these securities which the courts deny. I repeat, such an effort is immoral.

Like all immoral acts, whether of nation or of individual, the movement for physical valuation of railroads is also foolish. The protection that the courts throw around the innocent holder of this class of securities lies, as an essential fact, at the very foundation of the credit of our corporate securities, at home and abroad. The threat that this protection may be nullified by an executive order fixing the ultimate capitalization upon which the railroads will be permitted to earn a return, without reference to the amount of outstanding stocks or bonds, menaces all of our railroad securities. In times like these, when it is generally accepted that the one thing our industrial situation needs is restoration of the confidence of the investing public, here and abroad, in our railroad securities, how foolish it would be, by the adoption of such a policy of regulation, to justify and to confirm the suspicion with which these securities are now regarded in the markets of the world!

To those regulations which seek to place under the control of officers of the government the administration of the internal affairs of the railroads, everyone interested not only in their prosperity, but in the prosperity and safety of the country, should protest. I do not include in this condemnation those regulations effectively designed to protect the safety of traveler and employee, or to secure to the latter fair compensation for injuries suffered through the negligence of his employer. In those questions the public has a direct interest which it may rightly safeguard. But when, under guise of accomplishing these public purposes, government takes hold of the operations of the railroads in such a way as to intrude its authority between the control of the employer and the obedience of the employee, it takes a step not only unjust to the railroads, but unsafe both to the traveling and shipping public and to the state. It is universal experience that nothing tends to good service in any line of employment so much as the realization that continuance in the employment, with its consequent pay and hope of promotion, depends upon the character and loyalty of the service rendered.

It is, in my judgment, one of the regrettable effects of modern labor conditions—whatever may be the compensating benefits—that there has been largely substituted for this prop of self-reliance based on good service the all-supporting arm of the union. Intelligent and unprejudiced observers of the operations of our railroads trace a definite percentage of the increased operating costs of the past few years, of the decreased efficiency in service, of the increased casualties with their resulting growth of loss and damage to freight and loss of life and injury to persons, to the slackening influence of this very fact upon the hands and brains that load and make up and move the trains. If to this there be added the assurance to the employee that no longer his employer or his union, but a paternal government prescribes the hours and conditions of his employment, the nation itself will be the sufferer, not only in the diminution of its industrial efficiency, but in the deterioration of the fiber of its citizenship.

Nor should any governmental officer or body be given power to prescribe for the railroads schedules for the movement of perishable freight, or the conditions under which they shall interchange cars with their connections. I do not see how schedules for perishable freight can be made without making schedules for all other trains; and I do not think that government commissions or agents should make the time cards of the railroads. If control of these intricate details of operation, and of the relations and practices that shall determine the interchange of cars at every connecting point on our 225,000 miles of railroad, be put in the hands of the commission, what remains of the work of operating the lines will be so unavoidably involved in these regulations that it might as well all be conducted from Washington. If it be answered that the purpose of these provisions is to prevent discriminations in these particulars, the sufficient reply is that existing law prohibits all discriminations, prescribes punishment therefor by fine and imprisonment, and provides pecuniary compensation for the party injured. If, as a cumulative and preventive remedy for these particular species of discrimination, it is necessary for government to take over the operation of the railroads in these particulars, then, for the preventive protection of others who may be injured by other

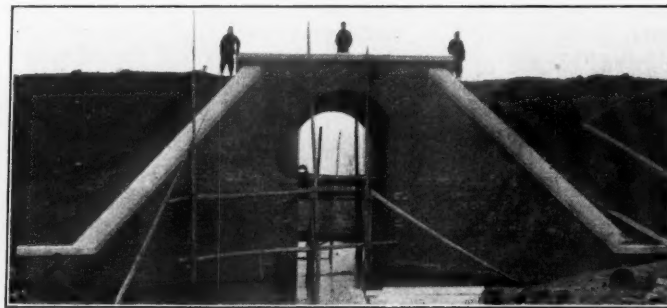
kinds of discrimination, the government should operate the railroads *in toto*.

It is as a citizen, rather than as a railroad man, that I decry the growing tendency toward this kind of railroad regulation. Every such regulation loosens, by just so much, the control of the railroad manager over the property in his charge, and lessens, in the same degree, his accountability to its owners. For the resultant decrease in earnings and increase in expenses the responsibility is shifted from his shoulders to the regulating power—the government. Now, it is established by law and admitted in all discussion, that the owners of the property are entitled from its earnings to a fair return upon its value. There is, therefore, no escape, in logic or in morals, from the proposition that, to the extent that governmental interference with the owner's control of the operations of his railroad diminishes the ability of the property to return the fair profit to which, under the law, he is entitled, the government must make the owner whole. In other words, if the government is to undertake, in whole or in part, the operation of our railroads, a government guaranty must go with the act. And I don't think that is a good thing for the Republic, however soothing it might be to the railroads.

The Shanghai-Nanking Railroad.

The awakening of China after centuries of slumber is perhaps better illustrated by the rapid construction of railroads than by any other evidences of modern civilization. It is only within the lifetime of the present generation that the first line was built—that from Shanghai to Woosung—and destroyed, for a frightened Chinese mob uprooted the rails and threw them with the rolling stock into the sea. Not only, however, has this short 10-mile line been long

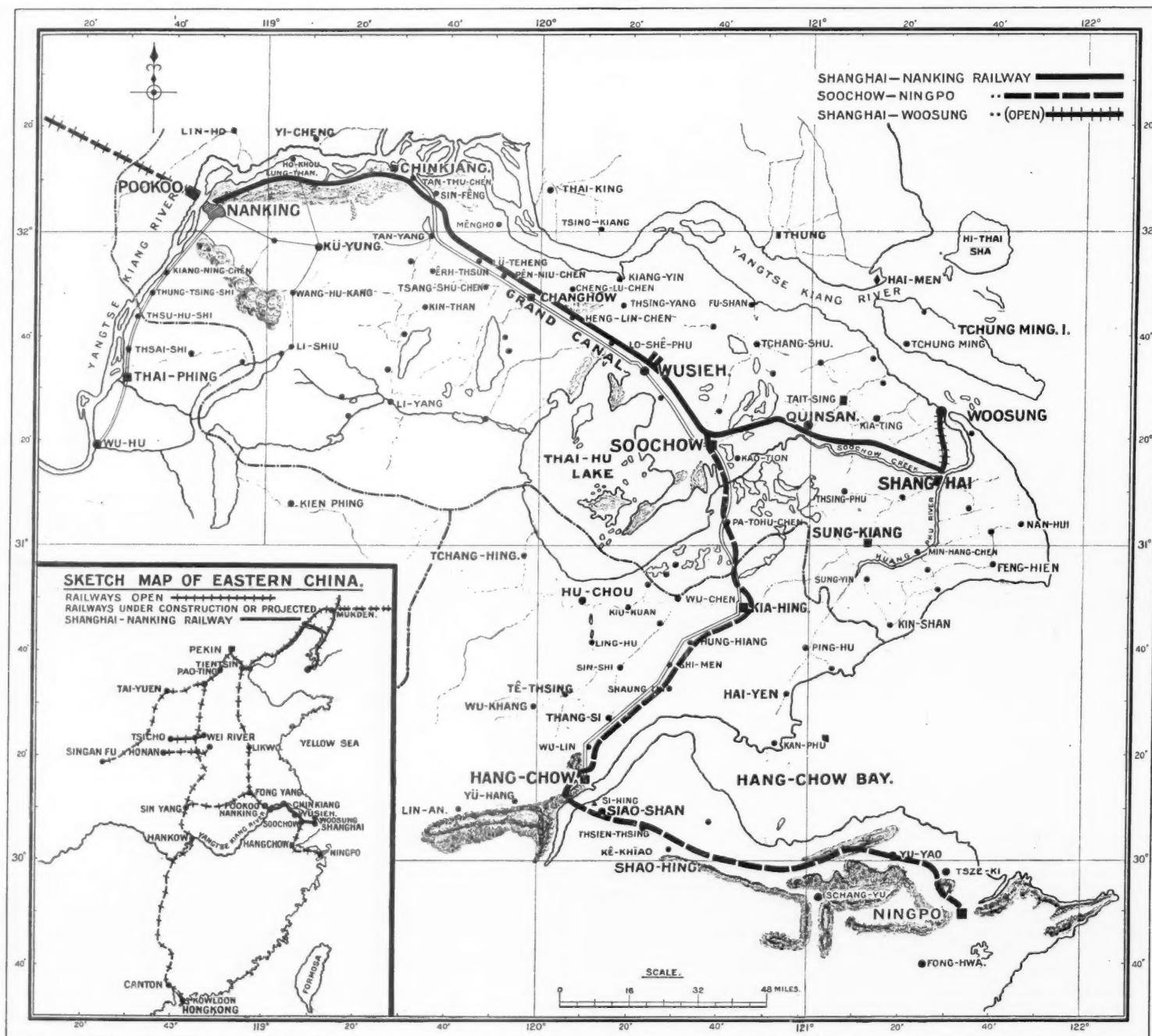
ago restored, but a very considerable mileage has been built in various parts of the country, and a large addition to this is now in hand. Among these lines is the important connection of the Chinese Imperial lines from Shanghai to Nanking. Preliminary



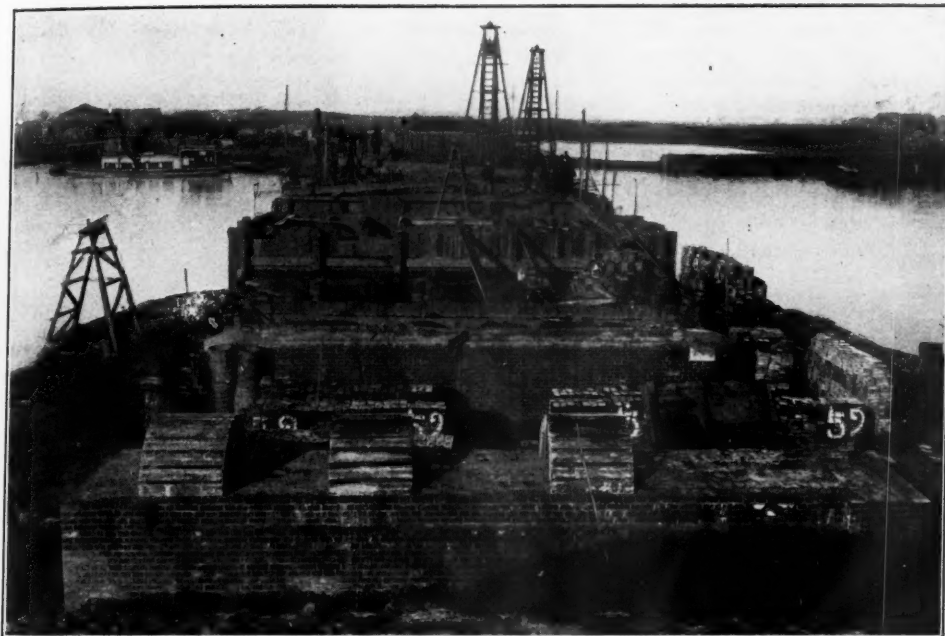
Small Bridge Near Soochow.

agreements were made some years ago by British capital and British engineers to build this line, and four others, the Tien-tsin-Yang-tsze, the Lin-Kwai-Quan-Sinyang, the Su-chan-Hang-chau-Ningpo, and the Canton-Hongkong lines. It was not, however, till 1903 that a definite agreement was signed enabling the Shanghai-Nanking line to be started. Its total length is about 200 miles, of which 150 miles from the Shanghai end has been opened for traffic, while the remainder is expected to be finished in July or August next.

The route follows, as much as possible, the natural and artificial waterways, these and their tributaries forming valuable feeders to the railroad. Starting from Shanghai, the line follows the bank of



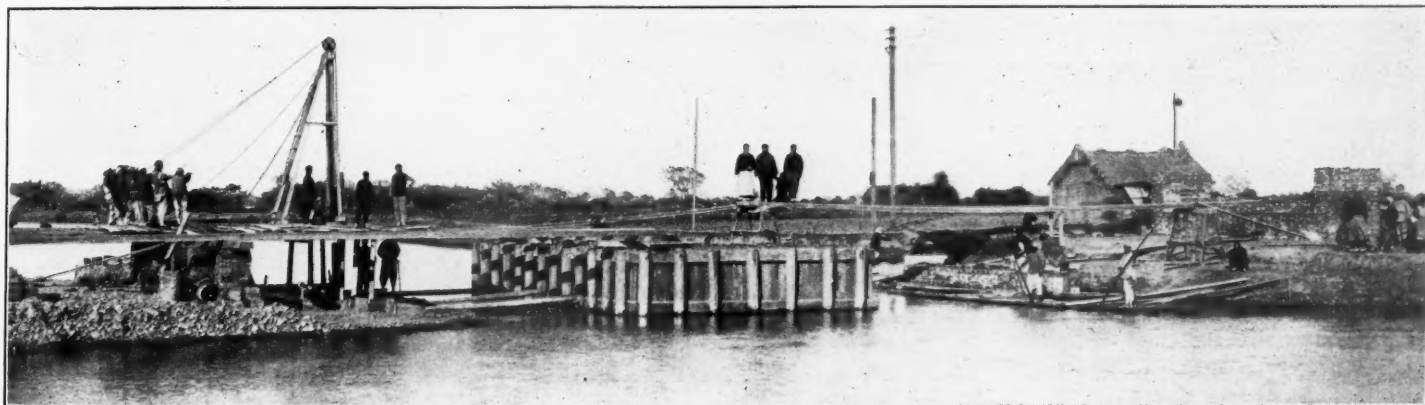
The Shanghai-Nanking Railroad and Its Connections.



Quinsan Viaduct; Shanghai-Nanking Railroad.

the Su-chan creek, and then that of the Grand canal, up to the important town of Chinkiang on the Yangtse-Kiang river. Following the south bank of this, one of the great rivers of China, Nanking is reached. The line stops here, leaving the river unbridged, the Pookoo terminus of the projected Tien-tsin line being at the opposite shore. The river is not only deep and wide at this point, but its bed is very unsuitable for bridge foundations unless expensive work is done. This important break in the connection between Shanghai and Ningpo and the capital Pekin will have to be dealt with by means of a steam ferry.

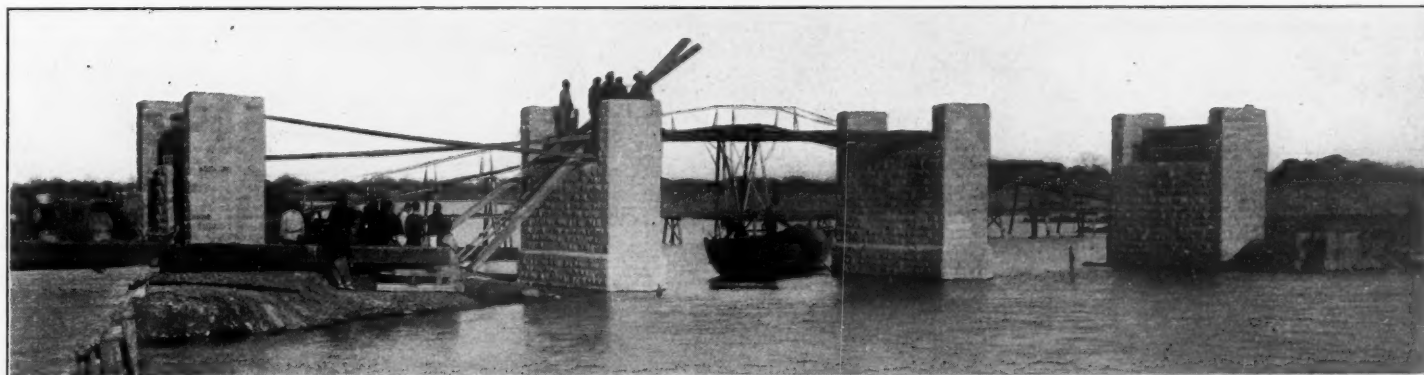
The location of the Shanghai-Nanking line, crossing so many waterways with a headway sufficient for sailing junks, has entailed a great deal of expenditure on bridge work. On the 57 miles between Shanghai and Su-chan where the canal is reached, there are 111 bridges, and 60 between there and Wusich, which is only 28 miles further, while the Grand Canal is to be crossed by a bridge of three 60-ft. girders near Chinkiang. The country is easy for construction to Wusich, where it becomes undulating, and after Chinkiang is passed, it is fairly mountainous. The only tunnel, which is 435 yards long, is on this portion, and from thence to Nanking



Building a Cofferdam; Shanghai-Nanking Railroad.



Bridge Arches Under Construction South of Soochow.

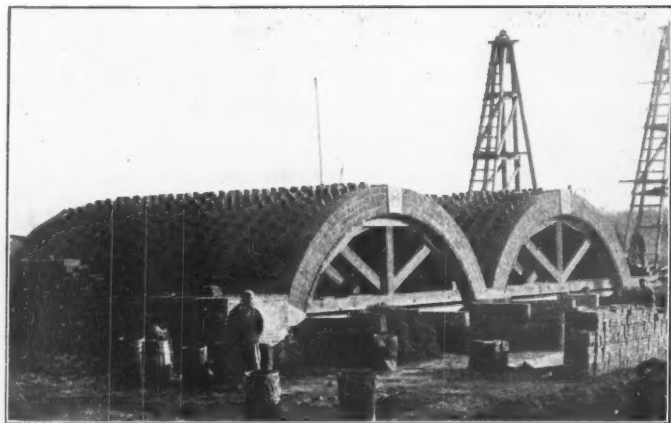


Bridging the Grand Canal.

the works are fairly heavy, there being many high fills and deep cuts in the Yangtze valley. The rails, 851 lbs. to the yard on Jarrah (Australian) ties, are laid for a single track, though the fills and bridges from Shanghai to Su-chan have been built for double-track, the road being a first class one, designed for high speeds and heavy freight, while the steepest grade is only 0.66 per cent. The gage is 4 ft. 8½ in.

The passenger locomotives have been supplied by Messrs. Robert Stephenson & Co., of Newcastle-on-Tyne, England, and the freight locomotives by the North British Locomotive Co. The rest of the rolling stock was built by the Metropolitan Amalgamated Railway Carriage & Wagon Co.

The Shanghai-Woosung Railroad, to whose tumultuous infancy we have already alluded, has been absorbed and partly rebuilt by the Shanghai-Nanking branch of the Imperial Railways, and at Woo-



Bridge Arches Under Construction North of Soochow.

sung completely equipped railroad shops have been erected for the manufacture of rolling stock and for locomotive repairs. These shops are driven and lighted by electricity. The estimate for the line, including the cost of land, is \$38,400 per mile. The district is one of the most populous in China, particularly between Shanghai and Su-chan, so that it is expected that this portion of the line will be double-tracked at an early date. The provinces of the Yangtze valley are the chief centers of the tea, cotton and silk

of the stations, with such other information as usually appears on the central column of the train sheet. On either side of the center, corresponding with the columns for train records, are grooves or slots into which slide the cards, each one to contain the record of a train. These cards are 18 in. long and 1¼ in. wide, and are arranged to contain all information concerning the train, such as delays, tonnage, etc. They fit securely into the spaces and are held so that each line on the card is opposite the name of the station to which it corresponds. Thus it answers exactly the purpose of the printed sheet. When the train completes its run the card containing its record is removed and filed away and the space may be used for another.

The advantages of the card system over the train sheet are many. The despatcher has no records before him except those of trains actually on the road. He may have all trains as near as possible to the central column instead of at a remote corner of the sheet. He is relieved of the inconvenience of handling two sheets at one time, a condition which always exists for several hours after midnight and sometimes continues until noon. The superintendent or other person wishing to examine the records of trains which have passed over the road, can get them from the file without interfering with the despatcher or his work.

Serious results have happened from a despatcher connecting a time with the wrong station on account of its being so far away from the station column. They have been known, also, to overlook a train still on the road, because of the many represented on the sheet with only here and there one still in existence. With the card system all are on the road and all near the center of the table. There is, in fact, a list of the stations printed on each of the slips, so that separation of station and time is impossible.

Car Surpluses and Shortages, April 29.

The Committee on Car Efficiency of the American Railway Association, Arthur Hale, Chairman, has issued Bulletin No. 21-B, giving a summary of surpluses and shortages of freight cars by groups from October 30 to April 29. The total of surplus cars reaches 413,605 in this report, being an increase of 37,835 cars over the report for April 15. The largest increase is in coal cars, although there is a marked increase in box, and slight increases in flat and miscellaneous cars. The box car surplus, however, is still 1,693 cars below the maximum for this class, which was reached on January 8. The increase is heaviest in Group 2 (Eastern), although Groups 3 (Middle), 5 (Southern) and 6 (Northwestern), also re-

SURPLUSES AND SHORTAGES BI-WEEKLY, FROM OCTOBER 30, 1907, TO APRIL 29, 1908, INCLUSIVE.

	Number of roads.	Surpluses.					Shortages.				
		Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
April 29, 1908.....	159	147,971	24,350	186,742	54,542	413,605	145	42	16	64	267
April 15, 1908.....	153	138,065	23,811	160,205	53,689	375,770	83	7	1	55	146
April 1, 1908.....	158	111,748	24,774	120,669	50,316	307,507	319	117	8	84	528
March 18, 1908.....	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
March 4, 1908.....	162	103,905	27,232	139,223	44,632	314,992	943	19	600	57	1,619
February 19, 1908.....	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
February 5, 1908.....	158	112,046	30,312	156,634	44,936	343,928	737	281	15	67	1,100
January 22, 1908.....	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135	738
December 24, 1907.....	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907.....	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907.....	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632	90,757

industries, and are the richest and most productive in China, being thickly peopled by a wealthy and industrious population. The length of time occupied by passengers in traveling from Shanghai up to Nanking by steamer is about 28 hours, while that by rail will be reduced to eight hours, and the time in conveyance of freight will be reduced in a still greater degree. Deep water wharfage exists, and is capable of extension, at Woosung, and there are a number of projected railroads with which the new line will be ultimately connected, leading to Peking on the north, and Hankow, Canton and Ningpo on the west and south. The railroad will be operated by a board of five commissioners, of whom three, including the engineer in chief, will be British, and the remaining two, Chinese. The consulting engineers to the railroad are Sir John Wolfe Barry and Arthur J. Barry, London.

We are indebted to the courtesy of the *Far Eastern Review* for the illustrations shown herewith.

A Compact Train Sheet for a Heavy Division.*

On the Northern Pacific the card system has been applied to the despatchers' train sheet. The large and often cumbersome sheet on which the records of train movements are kept has been abandoned and the despatcher's table is equipped with fixtures which admit of the use of the card system in its place. In the center of the desk there is, in permanent form, a column showing the names

*From the *Firemen's Magazine*.

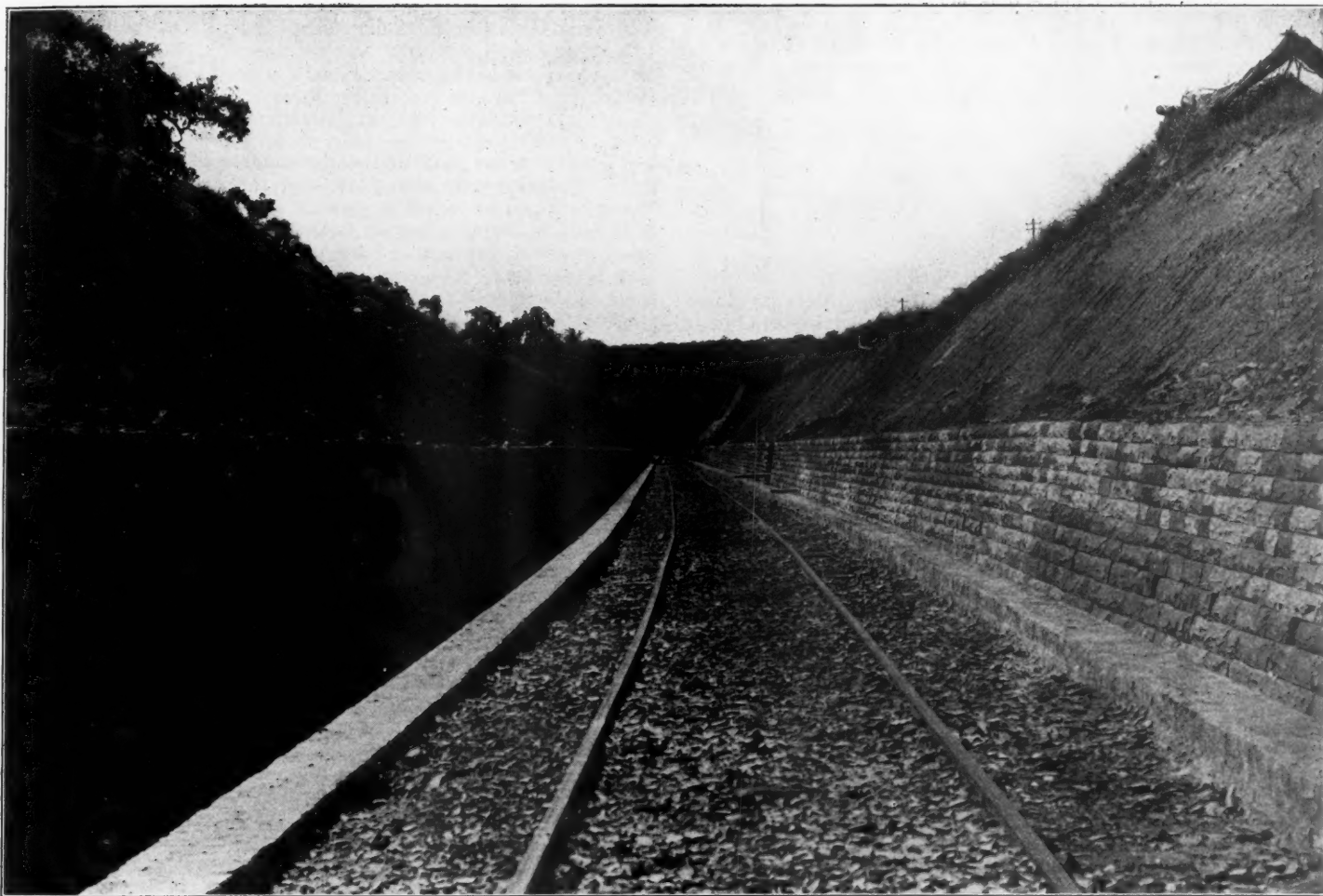
port quite large increases. The increases are slight in Groups 8 (Middle Western), 10 (Pacific) and 11 (Canadian), while Groups 1 (New England), 4 (North Atlantic) and 9 (Southwestern), show some improvement, the greatest gain appearing in the New England Group, which reports fewer idle cars than at any time since March 4.

The summary for 159 roads is shown in the double column table.

Protecting Wet Cuts in India.

The drainage and masonry protection of cuts through water-bearing ground is carried out on a much more enduring and expensive scale in Europe and some European possessions than in the United States. The photographs show the summit cut in the Durrah hills on the Nagda-Muttra State Railway, India. The maximum depth of the cut is 38 ft. It is through boulder-clay or treacherous yellow clay, mingled with black bottom soil. When it was first excavated, water ran through it for some months in a stream, owing to percolation from the neighboring hills, and a man would sink up to his waist in the slushy soil. Continuous drains 3 ft. x 3 ft., a mile long, have been made through the whole cut, with a ballast wall on one side and a massive revetment wall of dry stone on the other side. Both the revetment walls and ballast walls are amply provided with weep-holes, and are founded on a bed of concrete.

Between the ballast walls there is a deep layer of dry stone



Retaining Walls and Road Bed.



Revetment Wall and Drains in Durrah Hill Cut; Nagda-Muttra State Railway.

below the ballast. Where the soil is most treacherous, a concrete drain has been built half-way up the slope to interrupt the rainfall. Above the drain the soil is revetted with dry stone up to the top of the slope. Below the drain are dry stone counterforts and earthenware pipes carrying the rainfall into the solid masonry drains at foundation level.

We are indebted to *Indian Engineering* for the photographs and the details mentioned.

Transportation on the Great Lakes.*

BY WALTER THAYER,

Eastern Manager, Erie & Western Transportation Company, Philadelphia.

The prominence of the Panama Canal in the affairs of the nation has naturally resulted in greater interest in transportation by inland waterways. This is especially noticeable in the wider interest now being taken in our greatest waterways, the Northern Lakes, and in the conditions under which freight is handled on them.

Although the Great Lakes were originally individually navigable for boats of considerable size, the rapids at Sault Ste. Marie, and the narrow and shallow stretches of water connecting Lake Erie with Lake Huron, and Lake Huron with Lake Superior, through which the greatest volume of tonnage must pass, presented many obstacles to the passage of vessels. An increasing traffic transported, and a consequent decreasing cost of transportation, have accompanied the clearing of these impediments to navigation. The principal natural obstacles have been, and still are, the shallow water over the Lime Kiln Crossing, just south of Detroit, over the St. Clair flats not far above the same place, at the Straits of Mackinac, and, most important of all, the Sault Ste. Marie Rapids at the entrance to Lake Superior. The deepening by the United States Government of the first three stretches, and the building by the United States and Canada of the largest locks in the world at Sault Ste. Marie, where there is a total fall of about eighteen feet in three-quarters of a mile, now permit the passage of practically all the immense tonnage to and from Lake Superior. These improvements have perhaps yielded greater returns to this country than many times the same amount invested in any other character of public improvements.

The aim of this paper is to describe in a general way the origin, character and method of handling the tonnage of the Great Lakes.

TRAFFIC AND VESSEL TONNAGE ON THE GREAT LAKES.

Contrary to the general understanding this traffic consists of relatively few commodities, most of which are products of the mines, the forests and the grain fields, surrounding or lying beyond the Great Lakes. Iron ore and coal constitute the bulk of the tonnage.

The tonnage of ships and traffic passing the locks at Sault Ste. Marie gives the clearest index of the business handled on the lakes, though these figures do not include the tonnage passing between Lake Michigan and the East. Over one-third of the tonnage of ships under the American flag and half the steamers of 1,000 tons and upwards are on the Great Lakes, and last year the total tonnage of freight east and westbound passing over the Lime Kiln Crossing below Detroit, which would include the business of both Lake Michigan and Lake Superior to and from Lake Erie, amounted to over 70,000,000 tons in a season of 230 days. Over 25,000 vessels passed Detroit, an average of one ship every thirteen minutes, and 200 tons of freight per minute for the season. These figures exceed those of any navigable stream in the world. The records taken at the Sault Ste. Marie locks, indicate in a general way the character of this tonnage and the relative importance of the commodities of which it is composed. Last year the total freight through the Soo amounted to 51,751,080 tons, carried in 22,155 boats. It was valued at \$540,000,000, and was divided in the proportion about 80 per cent. eastbound and about 20 per cent. westbound. The principal eastbound business was:

Iron ore, 35,357,042 tons; wheat, 84,271,358 bushels; other grain, 54,341,155 bushels; flour, 6,495,350 barrels; copper, 107,633 tons.

Westbound:

Bituminous coal, 7,728,255 tons; anthracite coal, 1,011,275 tons; general merchandise, not comparatively heavy, but of relatively large value.

The larger part of the total is iron ore and coal, and the eastbound movement overshadows the westbound in tonnage, and also in what is known as "bulk" freight; i. e., ore, coal and grain as distinguished from package freight or general merchandise. The relation between the tonnage of the several classes of freight does not correspond with the ratios of the values. In 1905 it was estimated that of the total value of traffic through the Soo during that year, the value of the iron ore and products of iron represented 27 per cent.; cereals, 28 per cent.; copper, 7 per cent.; coal, both anthracite and bituminous, 5 per cent.; lumber, 4 per cent., and all other products, 28 per cent.

The total number of vessels on the Great Lakes early in 1907, with their gross registered tonnage, was as follows:

	No.	Gross tonnage.
Sailing vessels	519	269,136
Steam vessels	1,844	1,841,438
Canal boats	480	50,599
Barges	209	73,259
Total	3,052	2,234,432

Deducting the canal boats, the number of vessels actually engaged in lake traffic was 2,572, and the gross tonnage 2,183,833. The percentage of sailing vessels is decreasing year by year, most of those now running are on Lake Michigan. In 1895 sailing vessels carried 30 per cent. of the tonnage passing the Soo; in 1905 only 15 per cent. The craft on the lakes now range from the old boats of small size to the modern ore carriers made of steel, the latest of which are 605 feet over all, with sixty-foot beam, a depth of thirty-two feet, and a capacity of 13,000 tons. The barges referred to above are generally towed by steamers of the same line.

IRON ORE TRAFFIC.

The principal iron mining ranges are the Mesaba, Vermilion, Gogebic, Marquette and Menominee ranges, located in the territory adjacent to the western end of Lake Superior and in the upper peninsula of Michigan. The principal ore docks are located at Duluth, Superior, Two-Harbors, Escanaba and Marquette. The mines, as a rule, are located from ten to sixty miles back from the water, and the ore is hauled in specially constructed cars to the docks. These docks are so constructed that the cars from the mines are run out on them. The hoppers in the bottom of the cars are let down, and ore is discharged by gravity into pockets from the bottom of which iron chutes lead to the vessel lying alongside the dock. Through the hatches of the vessel the ore is chuted by gravity into the hold at as many points as there are hatches. In this way very little manual labor is necessary. A cargo of 9,277 tons of ore has been loaded into the steamer "E. J. Earling" at Mesaba Dock No. 4, at Duluth, in seventy minutes or on an average of 7,288 tons per hour.

Just here we have the keynote of the transportation service on the lakes, which is to secure for each vessel the least possible delay at port of loading or of discharge and consequently the greatest number of round trips possible in a season. The average number of trips that a modern vessel is able to make from the head of Lake Superior to Lake Erie is usually estimated at twenty per season, although with good dispatch at terminals some boats may make twenty-five, and even more. Every additional trip in a season reduces the average cost of transportation, and the entire carrying trade is ever pressing to reduce delay, whether at terminals or en route. To the genius displayed in devising plans to accomplish this result is due in no small degree the record the lakes have made in affording the cheapest transportation in the world.

Based on records at the Soo, in 1905, the average distance that freight was carried was 833.3 miles. The average cost was .85 mill per ton per mile, as against an estimated average cost for rail handling of about four mills per ton per mile. Ingenuity in effecting dispatch of boats made it possible for the steamer "W. E. Corey" to make thirty trips between Duluth and Lake Erie ports during the season of 1906, and in that time to carry the enormous total of 302,000 tons of iron ore.

The chief iron ore ranges, and to a large extent the vessels engaged in this trade, are owned by the larger iron and steel companies of the United States. The United States Steel Corporation, through the Pittsburgh Steamship Company, owns the largest fleet on the lakes, 101 vessels with an aggregate tonnage of 368,165 tons gross register, or about 16 per cent. of the total gross tonnage on the lakes. Next to them is the Gilchrist Transportation Company, with sixty-two vessels of 190,890 tons gross register; the latter, however, is not allied directly with the iron and steel interests. The chief steel companies, in addition to the United States Steel Corporation, now having ships on the lakes to carry their ore are the Lackawanna Steel Company, the Jones and Laughlin Steel Company, the Cambria Steel Company, the Tonawanda Iron and Steel Company.

The largest steamer on the lakes is the "Wm. B. Kerr," having a capacity of 14,000 tons of iron ore. She is the first of three sister boats, and there are others capable of handling from ten to twelve thousand tons.

The record cargo of ore is held by the steamer "Henry H. Rogers" from Escanaba to South Chicago, 13,333 tons, and over and over again this year greater cargoes of freight have been carried down the lakes than have ever gone out of the harbor of New York. The depth of water in New York harbor does not permit the largest ocean steamers to load to their full capacity, and the largest vessels are the fast passenger ships that carry but little freight.

The rate at which ore is carried on the lakes is practically fixed by the Pittsburgh Steamship Company, owned by the United States Steel Corporation, which decides what rates these boats will carry for, and the price they will give others to carry the balance of the ore used by them. In 1907 it was 75 cents per ton from the

*Reprinted by permission, from a paper in the *Annals of the American Academy of Political and Social Science*.

head of Lake Superior to the ore dock on Lake Erie, and from Marquette 70 cents per ton; while from Escanaba to Lake Erie ports the charge was 60 cents per ton, and from Escanaba to Chicago, a haul entirely in Lake Michigan, only 35 cents per ton.

In 1906 the charge for unloading iron ore was 20 cents per ton, while vessels that required trimming in order to adjust their cargo, paid about 3 cents per ton for that service. A cargo of ore loaded in a modern ore carrier, however, does not require to be trimmed.

The docks for the discharge of ore, unless such ore is for some iron industry located directly on one of the lakes, are generally owned and operated by the railroads leading south and east from Lake Erie to the furnaces of Pittsburgh and the Mahoning and Shenango Valleys, a distance of approximately 75 to 150 miles, or even farther, to the furnaces in Eastern Pennsylvania, where the ore is converted into iron and steel by the use of limestone and coke. Were it not for the necessity of using these articles in the manufacture of iron, and for the fact that iron ore, on account of the cheapness of lake transportation, is more economically brought to the coke, rather than the coke to the ore, the center of these industries might be in the neighborhood of Duluth rather than at Pittsburgh; and the tonnage handled on the lakes might be comparatively insignificant.

The docks are located at Ashtabula, Cleveland, Conneaut, Buffalo, Lorain, Erie, Toledo, etc., all on the south shore of Lake Erie, and handle about 86 per cent. of all the iron ore carried on the lakes. The above points rank in importance about in the order named, the largest number of tons handled in 1906 being at Ashtabula, with a total of 6,833,852 tons. The amount of ore received at Lake Erie ports was, in 1906, 32,076,757 tons, as compared with only 17,014,076 tons in 1901, a fact which furnishes a clear idea of the increase in the iron ore trade during the past few years. The difference between the total output and the receipts at Lake Erie ports is understood to be in the ore for furnaces at Detroit and South Chicago. Practically the entire success of a dock for receiving ore from a vessel, like a dock for loading vessels, depends on the ability to unload quickly and cheaply, and place in cars the tonnage that is daily brought alongside the docks by the gigantic ore carriers so constructed as to permit the hoisting and dumping by the most modern appliances, both electric and otherwise, of the greatest number of tons per hour in order to accomplish the quickest possible release of the vessel and effect the maximum saving in the cost of operation.

The efficiency of the machinery for unloading is shown by the record of the "George W. Perkins," 10,346 tons having been taken off in four hours and ten minutes, or at an average rate of 2,582 tons per hour. Moreover, this record is being approximated in the unloading of all similar boats, and it is the ambition of the managers of every dock to hold the unloading record. The records are being lowered year by year, and often more than once in a season.

GRAIN TRAFFIC.

Next in importance to the management of the ore traffic is the handling of grain. This trade is participated in by all kinds and sizes of vessels, and consequently there is more fluctuation in grain rates than in those for any other commodity. Grain originates beyond the western lake ports and is brought there by rail and placed in elevators. From the elevators it is shipped by vessel, generally to the ports of Lake Erie, the cost by lake being less than by rail. At the western lake ports elevators in connection with and often owned by the prominent eastern rail lines, receive the grain, and in due course load it into cars for export via eastern seaboard cities or for transportation to interior points. The rates per bushel for carrying grain depend absolutely on the number of boats available for the trade. Charters for the season, such as are made for ore in large quantities, are not characteristic of the grain-carrying trade. When grain is wanted for any particular vessel the rate depends on the supply of or demand for vessels; or, in other words, upon what happens to be the immediate condition or the number of boats available at the time, or upon the desire of the shipper for immediate forwarding. The rate thus made per bushel for forwarding say, to Buffalo, is known as the "going rate," and is a matter of public information on the various boards of trade at the points of shipment and remains the standard until altered by a change in the conditions above mentioned. The average rate on wheat from Chicago to Buffalo was 1.7 cents per bushel in 1906, and from Duluth to Buffalo 2.2 cents per bushel. Grain is the only commodity that is occasionally handled by what are known as the package freight lines, which are engaged in through traffic in connection with railroad lines. The boats of these package freight lines as a rule take grain only when it is necessary or expedient to fill out their freight capacity. At such times they bid for grain in competition with the bulk carriers, none of it handled by the package lines, however, is taken on through rates to interior eastern points, but only to eastern lake port elevators, from which the grain is reforwarded to ultimate destination.

In loading grain from the elevators it is spouted into the holds of the vessels through the hatches, and unloaded by placing an elevator "leg" through the hatches into the vessel. This so-called leg

is a contrivance on which is arranged an endless chain of buckets which scoop the grain out of the boat, carrying it up and into the elevator.

The largest grain cargo in number of bushels carried but not in tons, was 417,300 bushels of oats brought into Buffalo by the "Mary C. Elphicke."

The rates on which grain is carried by railroad from the eastern port elevator, if it goes to points east, are known as "At the East rates." This being a term used to indicate that the rate includes the cost of elevation from the vessel at eastern lake port and subsequent loading to cars, which service the ordinary rail rate would not include.

LUMBER.

Lumber is the other item of eastbound bulk freight on the lakes. The largest individual, although small, fleet in this trade is that of the Hines Lumber Company of Chicago. The rates this year have averaged, from Lake Superior to Lake Erie ports \$2.25 per thousand feet, and from Lake Michigan to Lake Erie ports \$2 per thousand feet. These rates are made by an association, with which practically all the lumber carriers are identified. The trade, however, seems to be falling off.

WESTBOUND COAL TONNAGE.

Coal is practically the only article handled in bulk westbound. This business is peculiar in its method of handling, for coal is the only westbound cargo available for ore carriers, and were it not for coal these ore carriers would go light westbound, as they often do, in order that they may secure as many loads of ore as possible in a season. The result of this is that coal is taken west at rates that would otherwise be impossible. It is hard to estimate the value of this to the people of the Northwest, to whom the coal is a necessity. Coal is handled in and out of the ship without charge to the vessel, and last year the hard coal rate averaged, from Buffalo to Chicago 46 cents and to Duluth 35 cents per ton. Soft coal averaged from Ohio ports to Chicago 46 cents and to Duluth 35 cents per ton. As practically all the ore boats are bound to Lake Superior the rates thence are lowest. Many of the big eastern coal companies have their own facilities and arrangements for handling coal at western lake ports.

PACKAGE FREIGHT SERVICE.

We may now consider the relation of the package freight lines to the traffic of the lakes. These lines are engaged in carrying all kinds of merchandise in such packages and of such size as can be transferred from cars to boats. Practically all passenger steamers on the lakes also carry package freight, although all package freight lines do not carry passengers, and in fact the big package lines, in operation between eastern and western lake ports, with perhaps few exceptions, do not carry any passengers, being made up exclusively of package freight boats. The most modern of these carry about 5,000 tons, and, as a rule, all of this is loaded between decks or in the hold reached through openings in the decks, the freight being handled in and out through gangways in the sides of the boat and up and down gangplanks from and to the docks.

There are several package freight lines, but they may be divided into two large classes:

First.—Those that make short runs between nearby ports or ports on the same lake, or are engaged in carrying freight, generally not of considerable volume, for local delivery at the ports at which they call.

Second.—Those lines that have through rates and prorating arrangements with the larger eastern and western rail lines, with which they connect.

The lines in the first class, on account of the generally local aspect of their service and of the fact that they are not usually a link in a through transportation service, may be passed over without discussion, in order that fuller consideration may be given to the other and more important class of package freight lines.

Although the business carried between ports on the Great Lakes by these lines is considerable in quantity and value, their chief traffic is that turned over to them as intermediate carriers between the rail lines leading east to the western lake ports of Chicago, Milwaukee, Gladstone and Duluth, etc., and west to the eastern lake ports of Buffalo, Erie, Cleveland, Detroit, Port Huron, etc.—this business to be again turned over by the lake lines to rail connections at the end of their route. To illustrate by a concrete example: business for rail and lake shipment may be taken in New York by the Pennsylvania Railroad to Erie and delivered to its lake connection, the Erie and Western Transportation Company, which takes the freight by water to Duluth or Chicago, as the case may be, and again turns it over to connecting rail lines to be delivered by them to consignees at St. Paul or Minneapolis. The same service may be performed in the other direction from Minneapolis, for example, to New York.

As these lines all have their rail connections, they may in turn be subdivided into two classes, according to the efficiency of their service. Some of them have direct routes, east of the lakes, for example, to and from New York, in connection with the big trunk line roads, such as the Pennsylvania Railroad and the New York

Central, while others are dependent on a short water haul, like the National Despatch, which takes business by water from New York to New London, Conn., and there turns it over to the Central Vermont Railroad, which in turn has a long haul in connection with the Grand Trunk to Depot Harbor, Canada, where it is at last delivered to boats to be carried to Chicago and points beyond. Another route is via canal boat through the Erie Canal from New York to Buffalo (requiring from twelve to fourteen days on the canal), where the freight is turned over to lake lines for forwarding west.

RATES BY THE LAKE LINES.

As a result of the different services thus offered there are three kinds of rates via the lakes: (1) westbound, from New York City, known as standard lake rates; (2) differential lake rates, and (3) canal and lake rates. These three are represented by the following rates in cents per hundred pounds, on the various classes, New York to Chicago:

	1.	2.	3.	4.	5.	6.
Standard Lake	\$0.62	\$0.54	\$0.41	\$0.30	\$0.25	\$0.21
Differential Lake .....	.52	.46	.35	.26	.22	.19
Canal and Lake .....	.42	.36	.29	.23	.21	.18

It will be seen how complicated must be the adjustment of rates by the various routes, and how greatly the charges must vary in accordance with the services performed, particularly when it is remembered that the service between these points is also performed by all-rail routes, differential rail routes, and by an ocean-and-rail route via Norfolk. These routes in turn have the following rates, first class, in cents per hundred pounds, New York to Chicago: all-rail, 75 cents; differential rail, 69 cents; ocean and rail, 65 cents.

During the season of open navigation a shipper in New York who wishes to forward a hundred-pound case of blankets to Chicago, has, among others, a choice of the following routes, in connection with each of which the charge would be in cents the amount mentioned; all-rail, 75 cents; differential rail, 69 cents; ocean and rail, 65 cents; standard lake, 62 cents; differential lake, 52 cents, and canal and lake, 42 cents.

Prominent among the commodities handled by the package lines, westbound, are sugar and cement. The eastbound business, however, is the heaviest and consists almost exclusively of flour, mill feed and copper, with occasional deck loads of shingles, and now and then grain if the vessels are unable to secure a full load of package freight.

OWNERSHIP AND RAIL CONNECTIONS OF LAKE LINES.

As between the standard and the differential lake lines, much the more important are the standard lake lines operating between Lake Erie and Lake Michigan or Lake Superior ports. These lines are, with the exception of the Soo line, generally owned and operated by the eastern trunk lines, as feeders at their eastern lake ports. The railroad-lake lines are:

	Operated To and From.	Owned by.
Erie & Western Transp. Co.*	Lake Michigan—Lake Superior.	Penn.
†The Western Transp. Co....	Lake Michigan—Lake Superior.	N. Y. C. & H. R.
The Union Steamboat Line...	Lake Michigan	Erie.
Mutual Transp. Co.....	Lake Superior.....	Lehigh Valley.
Lackawanna Transp't'n Co.	Lake Michigan.....	D. L. & W.
Lehigh Valley Transp. Co....	Lake Michigan.....	Erie.
Minneapolis, St. Paul & Buffalo Steamship Co. (Soo Line)	Lake Michigan	N. Y. C. & H. R.
		D. L. & W.
		Lehigh Valley.
		Minn., St. Paul
		& Sault Ste. Marie.

*Anchor Line.

†The Rutland Transp. Company, owned by the Rutland Railroad, runs from Ogdensburg, N. Y., to Chicago.—EDITOR.

None of these, except the Anchor Line, operates passenger steamers. Like the bulk freighters, every effort is made to accomplish as many trips in a season as possible, and the boats are consequently, with the exception of the passenger boats during the passenger season, not operated on any schedule, but are turned as rapidly as possible. To accomplish this large warehouses are maintained at eastern lake ports by these lines, in order that the cargoes of eastbound vessels may be immediately unloaded for subsequent shipment east. These warehouses are equipped with various devices to secure the greatest possible dispatch in the loading and unloading of boats, and in many cases separate houses are devoted to the east and westbound business. At the western lake ports the facilities for through business are provided by the delivering rail lines at whose terminals the package freight lines call for or deliver business routed in their care.

On account of the slower speed of handling and of the increased number of transfers incident to business shipped by rail and lake, as compared with all-rail, the rates are lower via the lakes than via the all-rail routes. The present difference is illustrated by the 17½-cent rate per hundred pounds on flour from Chicago to New York, via lake and rail as compared with 19½ cents per hundred pounds all-rail, and by the westbound rate of 23½ cents per hundred pounds, New York to Chicago, on sugar via rail and lake, as compared with 26 cents per hundred pounds all-rail. The difference between these figures, in each case, is

known as a differential. It represents the amount under the all-rail rate charged by the standard lines, which experience and long custom has established as being considered the difference between the value of the two kinds of service. The retail prices of granulated sugar and flour, per hundred pounds, being \$5.50 and \$3.50 respectively, it will be seen what a comparatively small part the cost of transportation must play in the price of such commodities to the consumer.

It is difficult to explain the various rates in existence over the several routes between the East and West; but it should be noted that the service via the lakes requires a transfer, where none is necessary when shipments are all-rail, and that there has grown up a fixed relation between the rates all-rail and the rates rail and lake, based on relative speeds, and that when reductions or advances are made in all-rail rates, consequent reductions or advances follow in the rates rail and lake, either eastbound or westbound. These principles of adjustment are further carried out in changes in rates by the differential rail-and-lake lines, and the canal lines.

The various standard lake lines were primarily considered as feeders for their rail connections, and in order that other railroads not equipped with lake lines may not reap the advantage of the tonnage thus provided, through prorating arrangements have been made only between the lake lines and their rail owners, or such other railroads as the owners of the lake line think it profitable to connect with.

SUMMARY—IMPORTANCE OF SERVICE OF PACKAGE FREIGHT LINES.

The foregoing discussion shows that by far the largest part of the tonnage of the lakes consists of ore, coal, grain, etc., handled in bulk by vessels ready to go from port to port for the highest compensation they can secure for their services. On account of the great quantities handled, and the ease with which it is loaded and unloaded, and also on account of the fact that the government has provided a free way and free harbors, the rates for transportation on the lakes are so low as to make unfair a comparison of those rates with average charges per ton per mile via rail lines.

The bulk freight handled on the Great Lakes consists almost exclusively of raw materials which can be moved at such low rates as to exclude competition by all-rail routes. With the package freight business the situation is different and there is active rivalry between the rail and water lines. The charges for package freight made by rail and water lines must be approximately equal because the difference in costs of the services by competing routes is relatively small.

Although the tonnage of package freight handled on the Great Lakes is small as compared with the volume of bulk traffic, the service performed by the package freight steamers is highly important. The package freight lake lines assist their rail connections by adding to the volume and regularity of their traffic, and afford the shipping public the choice between various routes. The shorter and more expensive routes provide a quicker service; the more circuitous, and to the shipper the less expensive routes, a slower service.

There is a business demand for both of these services. The package freight lines on the lakes perform a function of value to the carriers and to the public, and occupy an important place in the elaborate and delicately adjusted system of transportation that has grown up in the highly developed industrial section of the United States lying between the Mississippi River and the north Atlantic seaboard.

Foreign Railroad Notes.

The International Sleeping Car Co. made a profit of about \$1,700,000 in 1907 from its cars, and about \$240,000 from its hotels and restaurants, which are at winter resorts.

The head of the administration of the Hungarian State Railroads, who has 5,990 state employees under him, besides a small army of laborers, enjoys a salary of \$3,000 a year. (To be exact, \$3,034.50.) Among these employees are 193 "chief engineers" at \$1,000 a year. The salary of the lowest grade of official is \$320 a year.

An "abnormal physiological condition," according to Under Secretary of State Dari, is what caused a switchman to neglect to set a signal, for lack of which a serious collision occurred near Milan. A member of Parliament suggested that the abnormality of the switchman's condition was due to the propinquity of a drinking saloon.

To increase the capacity of the Giovi tunnel, which penetrates the Ligurian Apennines a few miles north of Genoa, it was determined to operate the line electrically from Ponte Decimo to Busalla. The more important electrical companies of the world were asked to compete for the installation, and the contract was let to the Westinghouse company, which will establish its power house at Vado, on the sea, about 30 miles southwest of Genoa.

GENERAL NEWS SECTION

NOTES.

The Richmond, Fredericksburg & Potomac has asked the Virginia State Corporation Commission to authorize the collection of an increased fare from passengers who needlessly board trains without having bought tickets.

At Austin, Texas, April 30, the Galveston, Harrisburg & San Antonio and the Texas & New Orleans were fined \$200 each for disobedience of the law forbidding passenger trains to wait at junctions more than 30 minutes for connecting trains.

The passenger steamships "Yale" and "Harvard," of the Metropolitan Steamship Line, have resumed their direct trips between New York and Boston by the "Outside Line" around Cape Cod. These steamers last summer made the trip in 15 hours.

The Interstate Commerce Commission, in a report to the Senate, recommends that express companies be prohibited from buying and selling, on their own account, commodities transported by express. The order and commission business done by the express companies is approved, including that feature under which express agents find a market for perishable goods.

At Castle Rock, Colo., May 7, train robbers shot and killed Express Messenger Charles Wright on train No. 4 of the Denver & Rio Grande, and the robbers appear to have escaped before their work was discovered. They secured but little money, being unable to open the larger safe. On May 12 robbers disguised as brakemen overpowered the express messenger on a train of the Great Northern Railway, near Seattle, Wash., and robbed the safe of several thousand dollars.

In the United States District Court at Chicago, May 6, fines of \$13,150 were imposed in 95 cases against six railroad companies, charging violation of the 28-hour law for the transportation of cattle. The roads fined were the Chicago, Rock Island & Pacific, 45 cases, fined \$6,550; Chicago & North-Western, 26 cases, \$3,600; Illinois Central, 9 cases, \$1,100; Chicago, Milwaukee & St. Paul, 7 cases, \$950; Atchison, Topeka & Santa Fe, 6 cases, \$750, and the Chicago, Burlington & Quincy, 2 cases, \$200.

It is announced that the Seaboard Air Line will, on June 1, reduce local passenger fares between Jacksonville, Fla., and River Junction, from 3 cents a mile to 2½ cents. The fare from Jacksonville to Tampa will be reduced from \$6.30 to \$5.80; from Jacksonville to Tallahassee from \$4.95 to \$4.55. The company will also sell mileage books, 1,000 miles, at \$20, good for the original purchaser; 2,000 miles, good for the purchaser, and four partners or employees, at \$40, the ticket to be used by only one person at one time, and a 500-mile family book, good within the state of Florida, at \$11.25.

The Arbitrary Depreciation Charge.

It has always been the understanding of railroad officials and has been the accepted practice on the best operated railroads, that operating expenses should show expenditures actually made. To put expenditure into operating expenses which have not been actually made, has been regarded as "padding" accounts. To make a charge for depreciation every month on a purely arbitrary basis, when the money thus charged is not actually spent in replacement, is obviously charging against operating expenses something for which no expenditure has been made. If it is advisable to make a charge for depreciation regardless of the fact that there is, in all probability, a counter credit greatly outweighing it, then that charge should be a charge against income account, to be offset by appropriations from income account when the money is taken from income for renewals or replacement.—F. A. Delano, in the Wall Street Journal.

Individual Car Owners' Association.

The Executive Committee of this association held a meeting at Chicago last week and instructed the President and Secretary to attend the meeting of the Master Car Builders' Association at Atlantic City, June 17, and that of the Car Accounting Officers at Niagara Falls, June 23, for the purpose of presenting the wishes of the individual car owners in regard to certain proposed improvements in service. Five resolutions were passed, as follows: First, to request the car accountants to have junction cards sent more promptly to private car owners, and to have train records of such cars sent to owners when asked for; second, to request the car accountants to put private cars on a more equitable basis in relation to their earning capacity. From October 1 the private car owners want 1 cent a mile for their cars. (The usual rate at present is

7½ mills a mile.) Third, that the members of the association should bring claims against and collect from railroads for misuse of their cars; fourth, that private cars ought to be loaded home by their proper route, and the accounting officers are requested to prevent diversion; fifth, the proposed adoption of distinctive marks to be put on private cars (for the purpose of reporting) under the auspices of the Car Accounting Officers' Association is approved, provided each owner is satisfied with the letter or letters assigned to his cars.

Railroad Earnings and Expenses in March.

The railroads shown in the two following tables, together with most of the railroads in the United States, show decreased gross earnings in March, 1908, from the corresponding month last year. The roads in the first table show a decrease in operating expenses proportionately larger than the decrease in gross. The roads in the second table show only as great a proportionate decrease in operating expenses, or a less proportionate decrease in operating expenses than the decrease in gross earnings.

TABLE I.

	March, 1908.	March, 1907.	Decrease	
			Amount.	Per cent.
National Railroad of Mexico:				
Gross earnings	\$1,345,031	\$1,407,974	\$62,943	4
Operating expenses	823,547	914,181	90,634	10
Union Pacific:				
Gross earnings	5,345,264	6,200,050	854,786	14
Operating expenses	2,948,462	3,600,797	652,335	18
Norfolk & Western:				
Gross earnings	2,059,373	2,777,455	718,082	26
Operating expenses	1,253,900	1,773,759	519,859	29
Nashville, Chatt. & St. Louis:				
Gross earnings	924,825	1,139,918	215,093	19
Operating expenses	704,694	909,014	204,320	22
Chesapeake & Ohio:				
Gross earnings	1,946,931	2,250,703	303,772	13
Operating expenses	1,274,156	1,526,866	252,710	16
Philadelphia & Reading:				
Gross earnings	3,068,634	3,701,401	632,767	17
Operating expenses	1,949,226	2,367,654	418,428	18

TABLE II.

	March, 1908.	March, 1907.	Decrease	
			Amount.	Per cent.
Lehigh Valley:				
Gross earnings	\$2,315,894	\$2,976,315	\$660,421	22
Operating expenses	1,579,142	1,845,089	265,947	14
Louisville & Nashville:				
Gross earnings	3,548,766	4,317,156	768,390	17
Operating expenses	2,579,484	2,946,913	367,429	12
Central of Georgia:				
Gross earnings	961,842	1,147,185	185,343	16
Operating expenses	*719,720	841,421	121,701	14

*Including taxes.

The Delaware & Hudson is an exception to the general rule. Its gross earnings for March, 1908, were \$1,512,865, an increase of \$58,979 over the same month last year, while its expenses and taxes were \$996,083 in March, 1908, an increase of \$38,814. Including a \$3,021 increase in net earnings from the coal department the company had net earnings of \$622,000 in March, 1908, an increase of \$95,000 over March, 1907.

Oklahoma and the Rock Island.

It is stated that the threatened suit to break up the alleged merger between the Chicago, Rock Island & Pacific and the St. Louis & San Francisco has been abandoned by Attorney-General West, and the Rock Island has agreed to readjust its rates from Oklahoma on lumber, live stock and milled products.

Steel Spelerized Tubes.

The railroad companies and the manufacturers of tubes have long been desirous of obtaining a steel tube that will take the place of the charcoal iron tube for locomotive work. For a number of years spasmodic attempts have been made to secure a tube of this character that would have the life of the iron one and would not pit in bad waters. The railroads have used such tubes as have been proffered, but, for the most part, have returned to the iron products after a trial of greater or less duration. The report now comes, however, that in a test of the comparative durability of iron and the spelerized tubes, the latter have shown the greater durability of the two as well as the higher physical properties. Further particulars and details of the work that has been done will appear in a future issue.

South American Railroad Strikes.

Railroad strikers in South America have had no cause to congratulate themselves on the results of their more recent campaigns in Argentina and Uruguay. The unconditional surrender at the end of January to the Buenos Ayres Great Southern management, over the dispute at the Banfield work shops, was followed last month by

the complete failure of the Uruguayan railroad strike. The trouble began with the men staying away from the shops merely out of sympathy with strikers on other railroads. There was no demand for higher wages, shorter hours or improved conditions of service, but the movement threatened to spread and to undermine discipline throughout the system. On this issue the management fought the strikers. Having closed the shops it reopened them again, but not to the ringleaders. Nearly all the old men stood out, but new men to fill their places were gradually obtained, and the indispensable work of the shops was carried out. Finally, the old hands, seeing their places being filled up, about the end of January mustered up sufficient courage to defy the ringleaders, who for some months had been exercising a reign of terror, and asked to be taken back unconditionally. All those for whom vacancies could be found, and on whom the company could reasonably rely for loyal service have been taken back, but they have forfeited their pensions and all other privileges of their past service.

The Alliance Electric Cantilever Gantry Crane.

The accompanying photograph shows a 25-ton electric gantry crane with double cantilever ends, designed and built by The Alliance Machine Company, Alliance, Ohio, for the Lake Shore & Michigan Southern, for use in the freight yards at Toledo, Ohio. Owing to the constantly increasing weights of single pieces of structural material and heavy pieces of machinery, castings, blocks of stone, etc., that railroads are called on to handle, the question of whether a road has, or has not, the proper facilities for quickly unloading these heavy pieces at their destination often determines whether a road gets this freight business or not.

The Alliance crane can unload a car of freight very quickly, and thus tends to relieve congestion in freight yards. When cars and tracks are in great demand and the consignee is not ready to receive his heavy freight, the cars can be unloaded and the contents piled along the tracks until the consignee is ready for it. The entire expense will probably be much less than demurrage charges. This crane should span two tracks between its supporting legs and leave ample room for a wide double wagon roadway between the tracks. These supporting legs should be the shape of the letter A, but with a clear opening between the diagonal members, as shown in the cut, so that the crane operator can pick up a piece of freight from a car on any track, transfer it along the bridge, and, if necessary, through the supporting legs to one of the cantilever ends of the crane and deposit it on the delivery trucks. The cantilever ends should be long enough to reach over one track and one wagon roadway, and the supporting legs of the crane should be designed so that no part thereof projects more than 24 in. beyond the center of runway rails, in order that proper clearance may be maintained between the railroad tracks. Local conditions, of course, may vary the relative location of tracks and wagon roadways. The crane should be supported on not less than eight track wheels mounted on equalizing trucks, so that the crane can accommodate itself to irregularities of the runway tracks. The cranes are built for direct or alternating current.

The crane shown has the following dimensions, etc.:

Lifting capacity—main hoist.....	25 tons at 12 ft. per min.
Lifting capacity—auxiliary hoist.....	5 tons at 60 " " "
Speed of trolley.....	125 " " "
Speed of bridge.....	250 " " "
Span, center to center of runway rails.....	55 ft.
Length of crane girders, over all.....	103 "
Distance, under side of crane girders to top track rails.....	23 "

Prussian Railroad Electrification.

During the past few months various Berlin suburban lines have been electrically operated, in order to provide the State Railway Department with practical working data. These lines are, of course, distinct from Berlin's new privately owned electric railways, such as the High Level & Underground Railway, and are all part of the State system. It is now announced that a beginning is to be made

with main line conversion for freight as well as passenger traffic. Two sections are said to have been chosen for experimental purposes—that between Leipzig and Magdeburg, a distance of 80 miles, and Leipzig to Halle, 23 miles in length. It is intended to reduce train length and weight by operating a smaller number of cars per train. The most careful comparisons between the cost of steam and electrical working are to be made in order that the results of conversion may show whether further electrification be commercially practicable and advisable. The sections chosen are admirably suited to this end, owing to the very heavy traffic passing over them, and very valuable data should be forthcoming as the result of electrification.

INTERSTATE COMMERCE COMMISSION RULINGS.

Switching Charges.

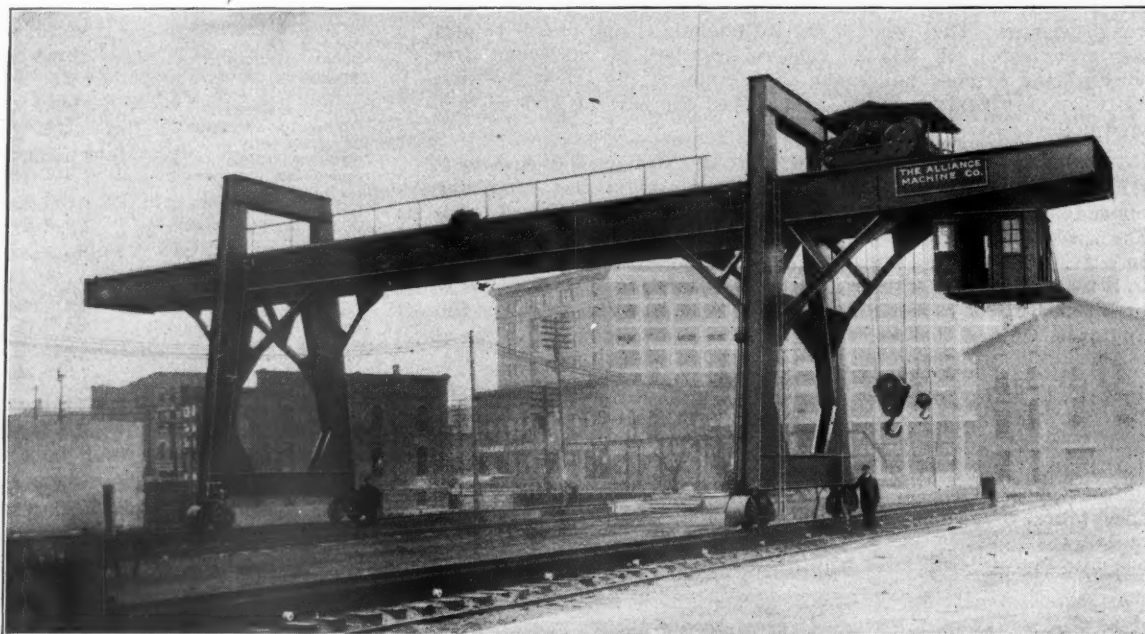
Wellington et al. v. St. Louis & San Francisco. Opinion by Commissioner Clements.

Complainants were awarded \$84.50 on account of the non-absorption of switching charges at Kansas City, Mo., on shipments of wood.

Special Excursion Rates.

Koch Secret Service v. Louisville & Nashville. Opinion by Commissioner Clements.

Defendant was found guilty of unjust discrimination in refusing a special excursion rate between Nashville, Tenn., and Evans-



Alliance Electric Cantilever Gantry Crane.

ville, Ind., to parties of 10 or more persons, in the employ of complainant, while giving a special rate to parties of 10 or more persons, engaged in other employments, between the same points at the same time. Reparation for \$85.50 was awarded.

Charges for Lumber.

Butters Lumber Co. v. Atlantic Coast Line et al. Opinion by Commissioner Clark.

Complainant is entitled to recover from defendants the sum of \$51.94, as reparation for unjust charges on certain shipments of lumber from Boardman, N. C., to Pottsville, Pa., and Schuylkill.

Rate on Cattle to Chicago.

Morti v. Chicago, Milwaukee & St. Paul. Opinion by Commissioner Lane.

The carrier's rate of 34 cents per 100 lbs. for the transportation of cattle from Leon, Kan., to Chicago, Ill., was held to be unreasonable to the extent of 2½ cents per 100 lbs., and \$38.50 was awarded to complainant.

Rate from Washington, D. C., to Glenndale, Md.

White Water Farms Co. v. Philadelphia, Baltimore & Washington. Opinion by Chairman Knapp.

A rate of 55 cents per ton charged by defendant on gross weight of car and lading for transportation of stable manure from Wash-

ington, D. C., to Glenndale, Md., was found unreasonable to the extent it exceeded 40 cents per ton on actual weight of shipment, and \$17.54 was awarded to complainant.

Refrigeration Charges on Oranges.

Fain & Stamps v. Atlantic Coast Line and Central of Georgia. Opinion by Commissioner Cockrell.

The parties adjusted the matter without a formal hearing, and consented that the Commission establish a rate for the future and order reparation. Accordingly an order was entered requiring defendants to enforce for two years a refrigeration charge on oranges in carloads from St Petersburg, Fla., to Atlanta, Ga., not to exceed \$35 per car. Reparation for \$50 was awarded.

Car Shortage.

Wood River Grain Co. v. Union Pacific. Opinion by Commissioner Clements.

Reparation on account of alleged unjust discrimination of defendant in not furnishing complainant with his share of cars for shipment of grain at Wood River, Neb., where competitors at that station were favored with grain cars, was denied, as the testimony disclosed that the time mentioned was during the car-shortage season, and that the business of complainant and his competitors suffered in common during that time.

Correction of Irregularities.

Bannon v. Southern Express Co. Opinion by Commissioner Clark.

The defendant's regulations as to contents of packages of fish from Haines City, Fla., to St. Louis, Mo., shipped under estimated weights have, in the past, been disregarded by the complainant and laxly enforced by the defendant, resulting in charges less than provided in tariff for actual weight shipped. On correction of those irregularities complaint was made that rate was unreasonable and reparation was demanded. The Commission said that the rate is not unreasonable and that where a shipper has in effect received a reduced rate on account of his own and carrier's irregularities, correction of those irregularities cannot be made the basis for an award of reparation. The complaint was dismissed.

TRADE CATALOGUES.

Electric Generators and Motors and Steel Armored Hose.—Bulletin No. 107 of the Sprague Electric Co., New York, describes continuous current, direct driven, type S generators. These are made in standard sizes from 25 k.w. up.

Bulletin No. 310 supercedes No. 301 and describes d.c. motors for operating ventilating fans and blowers. There are two types of these—the round type motors, and type D multipolar motors. The first type is furnished in nine sizes from $\frac{1}{4}$ h.p. to $7\frac{1}{2}$ h.p., shunt, series or compound wound, designed for 115, 230 or 500 volts. The other type is made in nine sizes, from 10 h.p. to 95 h.p., for standard slow speeds, and from 15 h.p. to 105 h.p. for standard moderate speeds, with the same windings and voltages as the round type. Small exhaust fans and desk and bracket fans are also described.

Bulletin No. 224 describes more fully the type D motors referred to above.

Bulletin No. 507 supercedes No. 505 and is devoted to flexible steel armored hose, which consists of rubber hose covered with a strip of galvanized steel wound spirally and interlocked. This hose is used for steam drills, pneumatic tools, air-brake and train line hose, etc. The bulletin also shows special hose fittings.

Acetylene Lighting and Appliances for Car Heating.—A pamphlet issued by the Gold Car Heating & Lighting Co., New York, describes the Gold improved system of acetylene car lighting. The generator, which may be placed in any convenient part of the car, holds enough carbide for several nights' service. No mantels are used and the burners, it is claimed, last for years without renewal. The pamphlet describes the system and its operation and is illustrated with photographs and drawings showing the piping, location of valves, etc.

Another pamphlet describes the improved temperature regulator and stop valve, which allows just enough steam from the train line to enter the radiators to maintain the proper temperature, the valve being set to give any heat desired. The pamphlet, which fully describes the device, is illustrated with drawings showing its operation and methods of application.

A third pamphlet describes, with illustrations, the improved gravity relief trap, which releases all water in steam couplings as

soon as the pressure is released, the valve closing when the pressure is restored.

Electric Motors.—Bulletin 98 of the Crocker-Wheeler Co., Am- pere, N. J., describes form L, belt type, d.c. motors in sizes from 0.05 h.p. to 5 h.p., and generators from 0.6 k.w. to 2.5 k.w. Illustrations show the motors driving centrifugal pumps, hoists, fans, various machine tools, and other machinery. Ratings, weights and dimensions of the different sizes are given.

Bulletin 99 describes the Crocker-Wheeler motors in the rail and structural mills of the Bethlehem Steel Co., South Bethlehem, Pa.

Bulletin No. 100 describes form I, belt type, d.c. motors of 5 h.p. to 45 h.p., and generators of 4.5 k.w. to 40 k.w. The motors are fitted for driving heavy machine tools. The usual dimensions, etc., are given.

Bulletin No. 95 describes belt type, a.c., 60 cycle generators, which are built in sizes from 35 K.V.A. to 200 K.V.A., either two or three phase, for voltages from 240 to 2,300 volts.

Electric Headlights and Electric Controllers.—Bulletin 4,579 of the General Electric Co., Schenectady, N. Y., describes a recently perfected arc headlight. The upper electrode is a copper forging, and the lower is an iron tube filled with a composition. It is claimed that this gives more light for the same wattage than the carbon arc, that the cost of operation and maintenance is very low, that the life of the copper electrode is from 2,000 to 3,000 hours, and that the lower electrode need be adjusted but once in 20 hours. Another advantage is that the light may be dimmed or "turned down" when passing through towns by reversing the direction of the current.

Bulletin 4,578 describes, briefly, various standard controllers for different operating conditions, and outlines the Sprague-General Electric type "M" control system.

Air-Brake Equipment.—Instruction pamphlet No. 5,034 of the Westinghouse Air-Brake Co., Pittsburgh, Pa., is devoted to the type L-triple valve. This is described, with photographs and drawings, and its operation carefully gone into.

Instruction pamphlet No. T-5,033 of the Westinghouse Traction Brake Co., Pittsburgh, Pa., gives similar information for the type M triple valve.

The air-brake company has published a reprint of a paper on The Effect of Brake-beam Hanging Upon Brake Efficiency, read by R. A. Parke before the New York Railroad Club, in November, 1897. The preface calls attention to the fact that practice has shown the correctness of the predictions and recommendations of this paper.

Turbines, Dynamos, Motors and Pumps.—The De Laval Steam Turbine Co., Trenton, N. J., has issued bulletin No. 501 describing its steam turbines and machinery driven by them. Besides the turbines, the company makes centrifugal pumps, blowers, d.c. and a.c. dynamos to be driven by turbines, and, also, electric motors. The turbine is a single wheel, with milled buckets set radially on its periphery. The steam is directed at the buckets through four nozzles. The disc revolves at high speeds, from 10,600 r.p.m. for the largest size to 30,000 r.p.m. for the smallest. It is geared down about 10 to 1 through helical gears, giving direct shaft speeds of from 600 to 3,000 r.p.m.

Roller Bearings.—Bulletin 31 of the Hyatt Roller Bearing Co., Newark, N. J., describes the construction, application and advantages of Hyatt bearings. These products have now been standardized and the company can furnish them in over 300 sizes, each adapted to a particular condition of speed and load. Each bearing has a capacity rating so that the customer can decide exactly what he wants. The pamphlet referred to gives sizes and price lists and full directions for selecting the style desired. Attention is called to the fact that the bearings are applicable to many special forms of machinery, industrial cars, line shafting in railroad shops, etc.

Power Hammers.—A booklet issued by Beaudry & Co., Boston, Mass., is devoted to the Champion power hammer. The hammer is belt driven and the hammer proper or ram is operated by a device making the blow elastic, and also making it possible for the hammer to deliver its full blow without regard to the size of the metal which is being forged. It is made in sizes from 50 to 500 lbs. weight of ram, taking forgings up to 6 in. bars. Sizes and prices are given and also a list of railroads using the hammer.

Signal Devices.—Reference catalogue No. 5 of the Hall Signal Co., New York, gives full price lists and order numbers of parts of electric motor and electro-gas automatic semaphore signals, iron masts and fittings for automatic disk and semaphore signals, mechanical semaphore and station signals and auxiliary devices, including switch locks, electro-mechanical slots, batteries, etc. The

catalogue is fully illustrated, each part on the drawings being numbered to correspond with the lists.

Engines and Centrifugal Pumps.—Catalogue F of the Erie Pump & Engine Co., Erie, Pa., describes centrifugal pumps, either direct connected or arranged for belt drive. These pumps are either single or multi-stage. It is claimed that the pumps can be used for handling any liquid, whether clear or having solids in suspension. The catalogue also describes two-cycle and four-cycle gas or gasoline engines of different types and sizes, and, also, vertical steam engines from 4 to 35 h.p.

Reinforced Concrete Bridges.—A 148-page pamphlet issued by the National Bridge Co., Indianapolis, Ind., gives photographs of 85 Luten reinforced concrete bridges designed and erected by the company, or in process of construction. The photographs are followed by sections and dimensions of the same bridges and by illustrated accounts of various structural features and methods of design.

Passenger and Freight Cars.—The Barney & Smith Car Co., Dayton, Ohio, has published a handsome souvenir pamphlet entitled "Cars We Have Built." It contains 31 pages and is filled with full-page half-tone views of passenger car exteriors and interiors, and several types of freight cars. The embossed cover is brown and gold and the whole is tied with brown silk cord.

Steam Gages and Valves.—The full catalogue of the American Steam Gage & Valve Manufacturing Co., Boston, Mass., is a cloth bound volume of 246 pages. It is fully illustrated and describes, with sizes and prices, gages, valves, indicators and other devices for controlling steam pressure, water, air, gas, oil, ammonia and other pressures. These include a wide line of articles.

Flooring.—A folder issued by the J. G. Ellendt Company, 1 Madison avenue, New York, describes Elasto flooring. This is a cement composition, which it is claimed, is silent, not slippery, waterproof, sanitary, fireproof and durable. It is laid in thicknesses from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. and is furnished in any color or combination of colors desired.

Lehigh Valley.—"Land o' Lakes and Mountains," issued by the passenger department, consists of many excellent photographs of attractive spots reached by the Lehigh Valley in New Jersey, Pennsylvania and New York, with brief descriptions of health and summer resorts. These include lists of hotels at each place, with capacities and rates.

Pipe and Valves.—The April issue of the *Valve World*, published in the interest of Crane Co., Chicago, has an interesting description of 26-in. pipes bent at angles of 90 deg. and 48 deg. on curves of 9 ft. radius. Another article describes and illustrates Crane oil separators for removing cylinder oil from exhaust steam.

Locomotives.—The Baldwin Locomotive Works, Philadelphia, Pa., has published a pamphlet describing, with illustrations, the locomotives built by the firm for the Central Railroad of Brazil. The pamphlet gives briefly the history of the road and describes the locomotives built for it since the first three were built in 1862.

Locomotive Front-End Steam Pipes.—Julian L. Yale & Co., Chicago, have prepared a pamphlet illustrating and describing the locomotive front-end steam pipes with universal joints which they make and sell. The troubles with other kinds of steam pipes are described and the principal advantages of the universal-joint pipe given.

Dust Preventative.—The Barrett Manufacturing Co., New York, has published a booklet showing a number of photographs of roads treated with Tarvia B, a new form of the compound, which can be applied without heating. The pamphlet gives the advantages of the material and quotes reports made of its successful use.

Boiler Compound.—A pamphlet entitled "Magic Methods," issued by the H. W. Johns-Manville Co., New York, describes Magic boiler compound. This is a liquid, which, it is claimed, acts mechanically instead of chemically, working its way between the scale and the metal so that the scale is loosened and drops off.

Reinforced Concrete Construction.—Recent circulars issued by the General Fireproofing Co., Youngstown, Ohio, give photographs and drawings of powerhouses and other buildings erected on the General Fireproofing Co.'s system, with pin connected girder frames, with plain and twisted lug bar reinforcement.

Spokane & Inland.—A pamphlet entitled "Profitable Farming in the Spokane Country" takes up the farming possibilities of the regions served by the Spokane & Inland. Photographs and texts

show strikingly what has already been done in raising wheat, fruit and vegetables and cattle and poultry.

Denver & Rio Grande.—A booklet issued by the passenger department on "Camping in the Rocky Mountains" lists, with brief descriptions, many camping grounds, giving distances from Denver and information as to nearby hotels. Estimates of the costs of several vacation trips are included.

Roofing.—A pamphlet entitled "Ruberoid Pete," issued by the Standard Paint Co., New York, sets forth the advantages of Ruberoid in the form of a conversation between a prospective customer and an old customer. Copies are sent to those interested on application to the company.

Thermit.—A pamphlet issued by the Goldschmidt Thermit Co., New York, describes butt-welding of wrought iron and steel and of pipes and rods with thermit. The pamphlet also contains revised price lists of appliances used for these welds.

Graphite.—The May issue of *Graphite*, published by the Joseph Dixon Crucible Co., Jersey City, N. J., contains notes on the use of graphite as a boiler scale preventive, and an article on crucible economy in brass foundry work.

Steel Tires.—The Standard Steel Works, Philadelphia, Pa., has published a reprint of the paper on Steel Tires—Causes of Defects and Failures, read by George L. Norris before the Western Railway Club last October.

Brake-Shoes.—A pamphlet issued by the Illinois Malleable Iron Co., Chicago, announces that this company has begun the manufacture of a full line of brake-shoes for steam and electric railroads.

MANUFACTURING AND BUSINESS.

Lawson & Simons, 505 Fisher building, Chicago, have opened a warehouse at 52 West Washington street.

D. O. Settlemyre, President of the Mount Vernon Car Manufacturing Co., Mt. Vernon, Ill., died in Litchfield, Ill., aged 81 years.

The Johnson Automatic Refrigerator Co. has moved its Chicago office from the Great Northern building to 209 Western Union building.

The Bettendorf Axle Co., Davenport, Iowa, has moved its Chicago office from 1590 Old Colony building to larger quarters at 1160-1170 Old Colony building.

The Dressel Railway Lamp Works, New York; Adreon & Co., St. Louis, and the L. J. Bordo Co., Philadelphia, Pa., which have joint Chicago offices, have moved them to larger quarters in 209 Western Union building.

Since the death of Mr. H. A. Clark, late President of the Central Inspection Bureau, New York, Mr. John E. Cobaugh has been made President and Treasurer; Mr. Geo. E. Pratt, Vice-President and General Manager, and Mr. T. C. Ashenfelter continues in the office of Secretary as formerly.

The Glacier Metal Co., Richmond, Va., expects shortly to erect a new plant in Manchester, across the James river from Richmond, for making Glacier anti-friction metal, Copper-Tin-bearing metal, and other babbitt metals. The works will be about 100 ft. x 40 ft., two stories high, with capacity for 25,000 lbs. of babbitt metal a day.

The Kennicott Water Softener Co., Chicago, has moved its office there from 527 Railway Exchange building to Suite 601 Corn Exchange building. The new forge and plate-forming shop has been completed. With the angle-bending plant recently installed the capacity for tank and steel plate work has been increased over 50 per cent.

The H. W. Johns-Manville Co., New York, is about to open a branch at 72 Jefferson avenue, Detroit, Mich., under the management of Willard K. Bush, who has been connected with the Milwaukee branch of the company for a number of years. A complete stock will be carried at Detroit, so that shipments can ordinarily be made direct from that city.

Willis C. Squire has opened an office at 209 Western Union building, Chicago, as manufacturers' agent for railroad supplies and specialties, gasoline locomotives, turntables, cranes, signaling devices, etc. His line includes rail drills and benders, insulated rail joints, combination tieplate and guard-rail clamps, semaphore blade clamps and adjustable switch-point brackets.

Bids will be received until May 25, 1908, by the Isthmian Canal Commission, Washington, D. C., for the supply of hoisting engines, car-tenoning machine, automatic car-gaining machine, repair parts for steam shovels and flat cars, chain, twist drills, taps, water-

closets, saw blades, mauls, hammers, track levels, lining bars, carpenters' braces, steam whistles, polishing paste, bran, cotton-seed meal, etc.

J. G. White & Co., Inc., New York, have been awarded the contract for a complete hydro-electric plant, with transmission lines, sub-stations, etc., for the Central Georgia Power Co., on the Ocmulgee river, about 36 miles above Macon, Ga., supplying power to Macon and to other places in the vicinity. The normal capacity of the plant will probably be 12,500 k.w., generated by water-wheels under a 100-ft. head. The crest of the dam will probably be 750 ft.

At the annual meeting of the stockholders of the General Electric Co., Schenectady, N. Y., on May 12, Vice-President B. E. Sunny, of Chicago, was elected a Director to succeed Frederick P. Fish, resigned. The other Directors were elected for another year, as follows: Gordon Abbott, Oliver Ames, C. A. Coffin, W. M. Crane, T. Jefferson Coolidge, Jr., George P. Gardner, Henry L. Higginson, J. Pierpont Morgan, J. P. Ord, Robert Treat Paine, 2nd, E. W. Rice, Jr., Marsden J. Perry, Chas. Steele and S. L. Schoonmaker.

The Westinghouse Machine Co., Pittsburgh, Pa., has an order for mechanical stokers, aggregating 14,400 boiler horse-power, for one of the large Brooklyn, N. Y., power stations operated by the Transit Development Co. (Brooklyn Rapid Transit). The order comprises 24 stokers suited to 600-h.p. B. & W. water tube boilers. This is the second large order given by this company for Roney stokers, the original 7,200-h.p. installation at the Kent avenue station having been in service for a year.

The Darley Engineering Co., 80 Broadway, New York, has been formed for the purpose of engineering, manufacturing and selling machinery and appliances for hoisting and conveying materials by suction and by air pressure. It has acquired the sole rights, for the United States, to make and sell the suction conveyor heretofore controlled by the Economic Engineering & Construction Co., Chicago, and it has taken over the business of the Economic Engineering & Construction Co., of Chicago, and the Darley Co., of Pittsburgh, Pa. W. W. Darley, President, will have charge of the Pittsburgh office. W. A. Stadelman, Vice-President, and M. D. Chapman, Secretary and Treasurer, will have charge of the New York office. W. A. Sharp, Vice-President, will have charge of the western business, with headquarters in Chicago.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, etc., see advertising page 24.)

Western Railway Club.

The annual meeting of this club is to be held May 29, at the Auditorium Hotel, Chicago, Ill. The committee was unable to secure suitable accommodations for an earlier date.

Engineers' Club of Philadelphia.

At a business meeting of this club to be held May 16, the papers to be presented are as follows:

"Sand—Its Use and Application in the Various Industries and Processes," by W. S. Reed, illustrated by lantern slides.

"Notes on the Theory of Steam Condensers," by Thomas C. McBride.

Accounting Officers.

The Association of American Railway Accounting Officers held its annual meeting at Washington, D. C., April 29 and 30 and May 1 and 2. The President of the association for the ensuing year is W. J. Hobbs, Fourth Vice-President of the Boston & Maine. C. G. Phillips, of Chicago, was re-elected Secretary. The next annual meeting of the association will be held at Cincinnati in April, 1909.

The White House Conference on Natural Resources.

The conference on the Conservation of Natural Resources called by President Roosevelt was convened at the White House, Washington, on Wednesday of this week, being attended by the Governors of forty-four states and territories and representatives from all the rest; and by representatives of about all the learned societies of the country. The principal subjects were introduced by the following prominent speakers: Ores and Related Minerals, Andrew Carnegie; Mineral Fuels, Dr. I. C. White, State Geologist of West Virginia; Soil, Professor T. C. Chamberlin, University of Chicago; Forests, R. A. Long, Kansas City; Public Health, Dr. George M. Kober, Dean of the Medical Department of Georgetown University; Reclamation of Land by Irrigation and Drainage, Dr. George C. Pardee, ex-Governor of California; Grazing and Stock Raising, Hon. H. A. Jastro, President American National Livestock Association;

The Public Lands and Land Tenure, Judge Joseph M. Carey of Wyoming. Water Resources: Transportation, James J. Hill, of the Great Northern Railway; Navigation, Professor Emory R. Johnson, University of Pennsylvania; Water Power, H. S. Putnam, American Institute of Electrical Engineers.

Invitations were sent to the chief officer of about every society devoted to the promotion of knowledge which is of national extent and to the heads of many others; for example: The American Association of Agricultural Colleges and Experiment Stations; American Association for the Advancement of Science; American Bar Association; American Federation of Labor; American Forestry Association; American Institute of Mining Engineers; American National Livestock Association; American Newspaper Publishers' Association; American Railway Association; American Railway Engineering and Maintenance of Way Association; American Statistical Association; Brotherhood of Locomotive Engineers; Brotherhood of Locomotive Firemen and Enginemen; Brotherhood of Railroad Trainmen; Farmers' National Congress; General Federation of Women's Clubs; Missouri Valley Improvement Association; National Association of Manufacturers; National Board of Fire Underwriters; National Grange; National Slack Cooperage Manufacturers Association; United Mine Workers of America, and about 40 others.

Railway Storekeepers' Association.

This association will hold its annual meeting at the Auditorium Hotel, Chicago, May 25, 26 and 27. One of the events in connection with this meeting will be the banquet on Tuesday evening, and which has heretofore been tendered the storekeepers by the supply men. This year the storekeepers decided to give this banquet themselves, and on behalf of the supply men, it has been proposed that those attending the banquet aside from the storekeepers pay at the rate of \$5 a plate, any excess of the actual cost to go toward providing entertainment for the banquet and a dinner and entertainment for the ladies.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Chicago, Milwaukee & St. Paul.—O. W. Dynes has been appointed Assistant General Solicitor, succeeding John A. Russell, resigned.

Georgia, Florida & Alabama.—J. F. Ingalls, formerly Acting Auditor of the Mobile, Jackson & Kansas City, has been appointed Auditor of the Georgia, Florida & Alabama, with headquarters at Bainbridge, Ga., succeeding W. H. Carroll, resigned.

Interstate Commerce Commission.—Charles A. Lutz, Assistant Comptroller of the Louisville & Nashville, has been appointed Chief Statistician of the Board of Examiners in the division of accounts of the Interstate Commerce Commission.

Kansas City Southern.—W. G. Street has been elected a Director, succeeding Y. Van den Berg, resigned.

Louisville & Nashville.—See Interstate Commerce Commission.

Operating Officers.

Chicago, Milwaukee & St. Paul.—Frank H. Myers, the new Superintendent of the Prairie-du-Chien and Mineral Point divisions, was born in 1872 at Adeline, Ill., and started work with the Chicago, Milwaukee & St. Paul in 1890 as telegraph operator on the Chicago division. Six years later he became agent on the Chicago division, and in 1899 was promoted to assistant train despatcher, and five years later was promoted to chief train despatcher. In September, 1907, he was made Assistant Superintendent of Terminals at Chicago, and was appointed to his present position May 1, 1908.

E. W. Morrison has been appointed Trainmaster at Minneapolis, Minn., succeeding P. L. Rupp, promoted.

Hocking Valley.—R. S. Quigley, Superintendent, has been granted leave of absence on account of ill health, and H. E. Speaks, Superintendent of the Toledo & Ohio Central, has been appointed Acting Superintendent of the Hocking Valley, with office at Columbus, Ohio. The position of Superintendent of Terminals at Toledo, Ohio, has been abolished; and C. A. Hoyt, dock agent, will assume all duties pertaining to dock operation. See Toledo & Ohio Central.

Jamestown, Chautauqua & Lake Erie.—Glenn E. Mason, Superintendent, has resigned and the office of Superintendent has been abolished. George F. Asper has been appointed Trainmaster, with office at Jamestown, N. Y.

St. Louis & San Francisco.—H. H. Brown, the new Superintendent of the Eastern division, with office at Springfield, Mo., was born in 1862. In 1893 he was made train despatcher at Monett, Mo., of the St. Louis & San Francisco. He became chief despatcher

in 1896 and Trainmaster in 1898. In 1902 he was transferred to Springfield, Mo., and the next year was made Superintendent of the Western division at Neodesha, Kan. In 1904 he was transferred to the Southern division, where he remained until his recent appointment.

Seaboard Air Line.—T. F. Whittelsey, General Manager, has resigned and the duties of his position have been assumed by W. A. Garrett, Chief Executive Officer for the Receivers.

Toledo & Ohio Central.—C. L. Gardner, Assistant Superintendent, has been appointed Superintendent, succeeding H. E. Speaks, transferred. W. F. Elrod, Superintendent of Terminals of the Hocking Valley at Toledo, Ohio, succeeds Mr. Gardner. See Hocking Valley.

Union Pacific.—J. B. Sheldon has been appointed Superintendent of Telegraph, with office at Omaha, Neb., succeeding L. H. Korty, resigned.

Vera Cruz & Pacific.—Clayton Byers has been appointed Superintendent, with office at Tierra Blanca, Vera Cruz, succeeding J. S. Langston, resigned.

Traffic Officers.

Chicago, Rock Island & Pacific.—S. S. Butler has been appointed General Agent at Fort Smith, Ark., succeeding J. L. Reinach, deceased.

Erie.—M. W. De Wolf, General Eastern Freight Agent, has been appointed special agent, with office at 50 Church street, New York. H. S. Stebbins, Manager of the Erie Despatch Fast Freight Line, succeeds Mr. De Wolf, with office at New York.

Engineering and Rolling Stock Officers.

Erie.—George H. Burgess, who was recently appointed Principal Assistant Engineer, was born on June 19, 1874, at Oshkosh, Wis. He graduated from the University of Wisconsin, Civil Engineering course, in 1895, and entered railroad service in 1896 as a rodman on the Pennsylvania Lines West. In October, of the same year, he was made Assistant Bridge Inspector, and two years later was appointed Bridge Inspector. In January, 1901, he became Assistant Engineer, which office he held until September, 1905, when he left the Pennsylvania Lines West to become Assistant Engineer on the Erie. A year later he was made Engineer of Terminal Improvements, and on May 1, 1908, was appointed Principal Assistant Engineer, with office at New York. The Erie is making extensive terminal improvements at Jersey City, N. J., and Mr. Burgess has been in direct charge of these improvements, assisted by A. L. Moorhead, Resident Engineer at Jersey City.

Illinois Central.—R. W. Bell, Master Mechanic at Waterloo, Iowa, has been appointed Assistant Superintendent of Machinery, with office at Chicago, succeeding J. G. Neuffer, promoted.

LOCOMOTIVE BUILDING.

The Fajardo Sugar Co. has ordered one consolidation locomotive from the American Locomotive Co.

The Eastern of France has ordered two Mallet compounds from the American Locomotive Co.

The St. Louis National Stock Yards have ordered one six-wheel switching locomotive from the American Locomotive Co.

The Paris-Orleans has ordered one 10-ft. 7-in. cut scoop wheel type standard gage rotary snow plow from the American Locomotive Co.

CAR BUILDING.

The Northern Pacific will build 500 stock cars at its own shops.

The Milwaukee Refrigerator Transit is considering building 100 refrigerator cars.

The International & Great Northern is asking prices on 750 thirty and forty-ton cars, including 500 box cars.

The Atlanta & St. Andrews Bay is said to be in the market for one combination baggage and mail car. This item is not yet confirmed.

The Western Heater Despatch (Starks Heater Car Co.), 189 La Salle street, Chicago, is in the market for 200 ventilated refrigerator cars.

RAILROAD STRUCTURES.

FREDERICTON, N. B.—Residents of this place have applied to the Minister of Railways for a new passenger station. They want one that would cost about \$60,000.

MONTREAL, QUE.—Authority has been granted to the Canadian Northern Quebec to build bridges over the Jordan river, near St. Sophie, and over the river Rouge near Montcalm.

PARKERSBURG, W. VA.—According to reports from East Liverpool, Ohio, the Parkersburg Bridge Company was recently incorporated at that place to build a bridge over the Ohio river; also an interurban railroad, at a cost of \$400,000. Joseph G. Lee, of the Knowles Pottery Co.; J. H. Brookes, S. C. Williams, of the S. C. Williams Co., and Charles Newell, of East Liverpool, are interested.

WINNIPEG, MAN.—A second bridge, it is reported, is to be built this year over the Assiniboine river by the Canadian Northern. It is to be of steel on concrete abutments.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA RAILWAY & ELECTRIC COMPANY.—This company proposes to build an electric line from Opelika, Ala., south to Eufaula, 60 miles, and eventually to the gulf. It is said that contracts for some of the work will shortly be let. A. M. Echanan is President, Opelika, Ala. J. C. Chapman, Atlanta, Ga., Vice-President and General Counsel, will have charge of letting the work.

ALTUS, ROSWELL & EL PASO.—This company proposes to build a line from Altus, Okla., west via Duke and Hollis to Memphis or Childress, Tex., thence southwest via Lubock, Tex., and Roswell, N. Mex., to El Paso, Tex., about 400 miles. Location surveys reported made from Altus to Hollis, 34 miles, and grading work is now under way. Contracts have been given to J. E. Hines, of Altus; A. Key and N. Anderson, of Duke. On this section bids are asked for ties, rails and material for bridges. E. E. Kennedy, President, and E. K. Stimson, Chief Engineer, Altus.

BOSTON & ALBANY.—See New York Central & Hudson River.

BLACK MOUNTAIN RAILWAY.—See Virginia & Southwestern.

BROWNSVILLE, MASONTOWN & SMITHFIELD STREET RAILWAY (ELECTRIC).—An officer writes that contracts have been given to the Pennsylvania Railway Construction Company, and the General Construction Company, of Pittsburgh, Pa., to build this company's proposed electric line in Pennsylvania with terminals at Uniontown, Morgantown, Brownsville and Bentleyville. Work is now under way and track has been laid on 1½ miles. There will be a number of viaducts and a bridge over the Monongahela river. (May 1, p. 623.)

CANADIAN NORTHERN.—D. B. Hanna, Vice-President of this company, is quoted as saying that the improvements to be made on the road during the present year will include relaying the main line between Port Arthur and Winnipeg with 80-lb. rails. The line west and north of Winnipeg is also to be improved. General Manager M. H. McLeod is quoted as saying that ties and rails will shortly be delivered and track laying started on the line to the Goose Lake District, Sask.

This company has built from Strathcona, Alb., into Edmonton, 4½ miles, and 21 miles from Edmonton west to Stony Plain. An extension of this line is projected west to the boundary of British Columbia, passing south of Jasper House, about 200 miles west of Edmonton. An extension is also projected north of this line from Edmonton northwest to the British Columbia boundary, 300 miles, crossing the McLeod, Smoky and Wapiti rivers.

The Edmonton & Slave Lake has been granted a change in location in townships 54 and 55, range 25 west, by the Board of Railway Commissioners. In 1904 plans were filed for the first 50 miles from Edmonton, Alb., northeast to St. Albert, thence north to near Edison and Independent settlements, about halfway to Athabasca landing. The line is in operation to Morinville, 23 miles, and work is reported under way on the completion of the line to Athabasca landing.

The Edmonton, Yukon & Pacific, it is said, has started surveys



George H. Burgess.

from Edmonton, Alb., west to the Pacific coast. It is understood that the route will pass through British Columbia about midway between the lines of the Canadian Pacific, and the Grand Trunk Pacific, and will reach the Pacific coast probably at Bella Coola or Bute Inlet. The company has been granted permission to build a branch to Burrard Inlet. Preliminary surveys already made traverse a portion of the coal fields in the northern Caribou district.

CANADIAN NORTHERN ONTARIO.—The branch lines already built and to be built by this company, and for which the government has granted a bonus of \$20,000 a mile, aggregate 50 miles, are as follows: From Sudbury, Ont., to Moose Mountain; a four-mile branch to Garrow mines; a branch to Key Inlet on Georgian Bay, and a branch from near Udney to Orillia, 10 miles. Surveys are made and it is expected that work on the last named line will be started this year. Surveys have been made between Orillia and Georgian Bay, to which point a branch may be built.

CAROLINA, CLINCHPORT & OHIO.—It is now said that this road, formerly the South & Western, will be finished from St. Paul, Va., south to Marion, N. C., by January 1, 1909. The road is now in operation from Johnson City, Tenn., south to Pine Ridge, N. C., 69½ miles; also on the northern section from Dante, Va., south to Fink, 17 miles. The section from Johnson City to Marion, N. C., will probably be put in operation by August 1. A tunnel will be driven through the mountains in Dickenson county, Tenn., which will be the largest on the line and much longer than that through the Clinch mountain at Clinchport, Va., which is being completed by the S. Walton Contracting Company. (See South & Western, Mar. 13, p. 394.)

CHICAGO, MILWAUKEE & ST. PAUL.—According to reports from Tacoma, Wash., this company has incorporated the Port Angeles Railway & Terminal Co., with \$1,000,000 capital to build the line to Olympic peninsula in the northwest corner of the state of Washington. The proposed line is to have its upper Sound terminal at or near Gig Harbor, opposite Tacoma, from which point a car ferry of three miles will connect with the St. Paul main terminal. A short branch is also to be built north to Bremerton. W. G. Collins, of Chicago, Ill., former General Manager of the C. & M. & St. P., is the principal promoter.

COLORADO & SOUTHERN.—This company, it is said, is making plans to build an extension of the Wichita Valley, now in operation from Wichita Falls south to Abilene, 150 miles. The improvements include an extension from Abilene, south to Uvalde, 200 miles, and eventually from that point southeast to a connection with the St. Louis, Brownsville & Mexico at Sam Fordyce, 225 miles.

COLORADO, HEREFORD & GULF.—Incorporated in Texas with \$420,000 capital to build a line from Dalhart, Texas, south via Hereford, thence southeast to San Angelo, about 400 miles. According to reports from Austin the company has notified the Texas Railroad Commission that contracts have been let for building the entire line from a point in Dallam county, and work is to be started at once both north and south of Hereford. The company has been granted a subsidy of \$60,000 by Hereford. The incorporators include A. D. Goodnough, G. W. Irwin, Jr., W. M. Knight, C. W. Dodson, C. F. Kerr and J. D. Thompson. The office of the company is to be at Hereford.

COLUMBUS, COLORADO & MEXICO.—Local reports state that this company, which is being promoted by residents of El Paso, Texas, will shortly let grading contracts for about 150 miles of the proposed line. The projected route is from Columbus, N. Mex., northwest to the Mogollon district, with a branch from Tyrone to Silver City. A. A. Bailey, President, El Paso.

DELAWARE & EASTERN.—The Appellate division of the Supreme Court of New York, Third department, has recently sustained the action of the old State Board of Railroad Commissioners granting certificates of public necessity and convenience to the Schenectady & Margaretville, which proposes to build an extension of the Delaware & Eastern from Arkville, N. Y., north to Schenectady, 70 miles. Also to the Hancock & East Branch Railroad, organized to build a southern extension of the Delaware & Eastern, from East Branch, N. Y., southwest to Wilkesbarre, Pa., 160 miles. (Mar. 13, p. 391.)

DENVER, LARAMIE & NORTHWESTERN.—Work, it is said, has been started by this company on its proposed line. The projected route is from Denver, Colo., to the northern boundary of Wyoming, about 500 miles. S. Johnson, President. (Feb. 28, p. 297.)

DENVER, NORTH-WESTERN & PACIFIC.—This company, since January 1, has finished 17 miles of the extension it is building from Yarmony, Colo., towards Salt Lake City, Utah. Contract from Yarmony to Steamboat Springs, 68 miles, let to the Denver-Steamboat Springs Construction Company, of which Col. D. C. Dodge is President. In the line through Egeria canyon there will be two tunnels aggregating 2,400 ft. It is expected to open the line for operation from Yarmony to McCoy, 11 miles, May 15; to Toponas, 29 miles, August 15, and to Steamboat Springs by October 1.

EDMONTON & SLAVE LAKE.—See Canadian Northern.

EDMONTON, YUKON & PACIFIC.—See Canadian Northern.

FRANKFORT, DELPHI & CHICAGO TRACTION.—Incorporated in Indiana with \$100,000 capital. The company proposes to build a line from Frankfort, Ind., northwest via Delphi and Monticello, to Hammond, about 125 miles. The Directors are A. S. Strauss, Wm. H. Conee, C. E. Hayman, Edward A. Stonehill, Herbert F. Wills. The headquarters of the company will be at Frankfort.

GREAT NORTHERN.—The Vancouver, Victoria & Eastern, through a consolidation of the Vancouver, Westminster & Yukon and the Victoria Terminal Railway & Ferry Company, now has under construction lines as follows: From the international boundary to Olivers, B. C., 11.32 miles, on which track has been laid for one mile and work is under way on the rest of the line. Line building from Brownsville, B. C., to Olivers, 9.80 miles, track laid on five miles. Line from Cloverdale, B. C., to Sumas at the international boundary, 26.25 miles, track laid on 1.40 miles and work is under way on the rest of the line. At Sumas Junction, B. C. (Sumas, Wash.) there is a connection with the Bellingham Bay & British Columbia Railway, the Northern Pacific, and the Canadian Pacific branch from Mission. Work is also under way on the line from Keremeos west to Princeton, 45 miles, on which grading is finished as far as Hedley. Surveys from Princeton to Sumas have been made, but have not yet been finally approved. (March 13, p. 391.)

This company, it is said, has projected branch lines as follows: Dewey Lake, Minn., north to International falls, about 78 miles, partially graded; Greenbush, Minn., northwest to Warroad, 44 miles, grading finished; Wenatchee, Wash., near where the line crosses the Columbia river, north to Oroville, 140 miles, partially graded.

HANCOCK & EAST BRANCH.—See Delaware & Eastern.

HOLSTON RIVER RAILWAY.—See Virginia & Southwestern.

MARYLAND ELECTRIC.—The proceeds of the remaining \$250,000 first bonds of the Baltimore-Annapolis Short Line are to be used in building a terminal station in Annapolis, also for connections for entering Baltimore and other purposes.

MYERSDALE CONSTRUCTION & EQUIPMENT COMPANY.—This company was recently incorporated with \$100,000 capital in Delaware to build railroads. The incorporators are H. D. Breen, W. A. Wood, Pittsburgh, Pa.; W. W. Stand, Bellevue, Pa.

NEBRASKA, KANSAS & SOUTHERN.—An officer writes that this company has not definitely financed its proposed line, and no active work will be undertaken until this is accomplished. The company was organized to build from Superior, Neb., southwest through Kansas, via Stockton, Ransom and Ness City, to Garden City, 267 miles. Definite location made from Stockton to Garden City, 167 miles. The work will include two steel bridges and handling about 25,000 cu. yds. per mile, including some rock work. (Mar. 13, p. 392.)

NEW YORK CENTRAL & HUDSON RIVER.—According to a statement of Woodward Hudson, of this company, it is proposed to spend \$4,543,753 of the Boston & Albany bond issue for improvements on the road during the present year.

Reports from Buffalo, N. Y., state that this company is about to establish a large gravity freight yard at Suspension Bridge to handle freight coming from points north of Lake Erie. Freight from points south of Lake Erie is to be handled in the extension of the yards now being made at Gardenville, near East Buffalo. When finished the latter yards will have a capacity of 22,000 cars. At present there are 27 miles of tracks in use.

OREGON ELECTRIC RAILWAY.—An officer writes that this company now has its line in operation from Portland, Ore., south to Salem, 50 miles, and is building a branch from Garden Home on the main line, west to Hillsboro, 12 miles. The Willamette Construction Company is doing the work, and W. S. Barstow & Co. are the engineers. After this branch is built, work is to be started on other proposed branches and extensions. (May 1, p. 623.)

PEACH RIVER & GULF.—Plans, it is said, are being made by this company to build an extension from its present eastern terminus at Bartle, Texas, east to Beaumont, where connection is to be made with the Galveston, Beaumont & Northeastern. Plans are also under consideration to build an extension south to Anahuac on Trinity bay.

PENNSYLVANIA.—It is said that orders to begin the work on the tunnel at Greensburg, Pa., which was stopped last fall, have been given by this company. About \$1,000,000 will be spent cutting down the tunnel, reducing the grade and making a cut wide enough for six tracks.

The northern tunnel of the two which this company has been building under Bergen Hill, Hoboken, N. J., as part of its New York City improvements, was recently driven through. (April 17, p. 559.)

PORT ANGELES RAILWAY & TERMINAL Co.—See Chicago, Milwaukee & St. Paul.

SCHENECTADY & MARGARETVILLE.—See Delaware & Eastern.

SOUTH DAKOTA ROADS (ELECTRIC).—J. A. Cleaver, of Huron, S. Dak., is organizing a company to build an electric line from Huron north to Aberdeen, 82 miles. It is said that the necessary franchise for terminals at Huron has been secured, and application has been made for similar privileges at Aberdeen. Surveys started. Cross & Mack, of Minneapolis, will have charge of the work.

STUEBENVILLE & EAST LIVERPOOL (ELECTRIC).—An officer writes that this road is to form part of the line from Toronto, Ohio, north and east to Vanport. The company now operates a line from Steubenville, Ohio, to Wellsville, including the local lines in the city of Steubenville; and the East Liverpool Traction, which covers all lines in East Liverpool and Wellsville, and Liverpool township, also Chester, W. Va. The lines are run in connection with the Ohio River Passenger Railway, under construction for the past two years, from East Liverpool to Vanport, Pa., and now in operation from East Liverpool to Midland. At Vanport connection is to be made with the Beaver Valley Traction Company's lines to Rochester, Pa. Van Horn Ely is President; Edward McDonnell, Secretary and Treasurer, and J. C. Rothery, General Manager, of all three lines, which, however, are separate and distinct companies. (May 1, p. 624.)

UNION CENTRAL.—This company was organized last year to build a line from Dallas, Texas, southeast to New Orleans, 500 miles, of which 225 will be in Texas, and 275 miles in Louisiana. It is said that a contract to build 20 miles was recently given to the Tenney Construction Company, of Silver City, N. Mex., of which J. A. Sinclair is General Manager. A branch is also projected from Wortham, Tex., northeast to Tyler, 90 miles. This branch has been surveyed and surveys are now being made on the main line. W. J. Hogue, President, Dallas, and J. A. Eutis, Secretary and Treasurer, Edgewood. (Feb. 14, p. 234.)

VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

VANCOUVER, WESTMINSTER & YUKON.—See Great Northern.

VERA CRUZ TERMINAL.—This company, organized in London with a capital of \$6,000,000, expects shortly to let contracts for new terminal buildings and improvements at the Port of Vera Cruz, Mex. According to the plans, the proposed improvements will cost about \$6,000,000. The company is composed of the several railroads entering Vera Cruz. The general office is at the City of Mexico. (Nov. 1, p. 542.)

VIRGINIA & SOUTHWESTERN.—An officer writes that this company has taken over the properties of the Black Mountain Railway, with a main line 30 miles long, and branches lately completed and now in operation, and the Holston River Railway with about 38 miles partly finished. Construction work has been suspended on the latter for the past two months; plans for the completion of this line have not yet been perfected. (Mar. 13, p. 395.)

VICTORIA TERMINAL RAILWAY & FERRY CO.—See Great Northern.

WICHITA VALLEY.—See Colorado & Southern.

RAILROAD CORPORATION NEWS.

BUFFALO, ROCHESTER & PITTSBURGH.—Wm. A. Read & Co., of New York, offer \$200,000 Buffalo, Rochester & Pittsburgh 4½ per cent. consolidating mortgage bonds of 1907-1957. The total authorized issue is \$35,000,000, of which there is outstanding \$1,737,000.

CHICAGO, JOLIET & KANSAS CITY.—It is announced that a special meeting of the stockholders is to be held in Chicago, July 6, to authorize an increase in the capital stock. This is a projected road from Chicago, via Joliet, Ill., to Kansas City, Mo., 350 miles.

CHICAGO RAILWAYS CO.—It has been announced that this company has sold \$1,200,000 collateral 6 per cent. notes secured by \$1,666,000 Chicago Railways consolidated mortgage 4 and 5 per cent. bonds.

DENVER & RIO GRANDE.—See Western Pacific.

ERIE.—See Pittsburgh & Lake Erie.

GREENWICH & JOHNSONVILLE.—The Public Service Commission of New York, second district, has approved of a consolidated mortgage to secure \$1,000,000 30-year 5 per cent. bonds of the Greenwich & Johnsonville. The company is to issue \$400,000 of these bonds to pay indebtedness incurred in the construction of its Salem branch from Greenwich to the connection with the Delaware & Hudson. The remaining \$600,000 bonds are to be held by the company.

ILLINOIS CENTRAL.—It is officially stated that the Illinois Central will begin regular operation of trains into Birmingham, Ala., by the end of April. The Mobile & Ohio will come into Birmingham over the same tracks.

INTERNATIONAL & GREAT NORTHERN.—The receiver, Thomas J. Freeman, has been authorized to issue 6 per cent. receiver's certificates to pay the \$338,730 interest due May 1 on the first mortgage bonds. The certificates are to be secured by a first lien on the net revenues of the company and are to be sold at not less than par.

KANSAS CITY, FORT SCOTT & MEMPHIS.—The first mortgage 7 per cent. bonds maturing June 1, 1908, of which there are now outstanding \$2,055,300, are to be extended until June 1, 1911, at 5 per cent. interest.

METROPOLITAN STREET RAILWAY.—Holders of the general mortgage and collateral trust 5 per cent. bonds of 1897-1907 of the Metropolitan Street Railway, of New York, are asked to deposit these bonds with the Guaranty Trust Company, of New York. The interest due on Feb. 1 was not paid, and the trust deed provides that after 90 days the default becomes absolute.

METROPOLITAN WEST SIDE ELEVATED RAILWAY (CHICAGO).—The Farwell Trust Co., and N. W. Halsey & Co., of Chicago, have bought the remaining \$1,250,000 of an authorized \$5,000,000 extension and terminal first mortgage 4 per cent. bonds. The sale of these bonds provides for the retirement of equipment notes and loans falling due June 1.

MIDLAND VALLEY.—All of the \$5,600,000 old notes of the Cherokee Construction Co. have been deposited and holders will receive in exchange Midland Valley first mortgage 5 per cent. bonds and new Cherokee Construction Co. five-year 6 per cent. notes. These notes are dated December 2, 1907, and are due December 1, 1912. Of the authorized issue of \$2,500,000 only \$1,650,000 is outstanding.

NEW YORK, NEW HAVEN & HARTFORD.—The Supreme Court of Massachusetts has decided that the control of street railway companies in Massachusetts by the New York, New Haven & Hartford is illegal. Charles F. Choate, Jr., counsel for the road, gave out the following: "The company will promptly obey the decree of the court. We believe the principle enunciated by the court applies as well to the holding of Boston & Maine stock by the New Haven Company, and that it will be necessary for the company also to dispose of this stock unless the legislature decides that it is consistent with the interests of the commonwealth that it should be retained."

PITTSBURGH & LAKE ERIE.—Trackage rights on the Newcastle & Sharon 20-mile branch of the Erie have been obtained by the Pittsburgh & Lake Erie.

PUBLIC SERVICE CORPORATION OF NEW JERSEY.—Of the authorized issue of \$50,000,000 first mortgage 5 per cent. bonds of 1908, only \$3,725,000 are to be issued at present, and this amount has already been sold by the company.

ST. LOUIS & SAN FRANCISCO.—The proceeds of the sale to J. & W. Seligman and Redmond & Co., of New York, of all the refunding mortgage bonds free in the company's treasury, together with \$1,353,000 of the same bonds pledged among other collateral to secure \$1,750,000 notes with the Mercantile Trust Company, are to be used to pay at once the \$1,750,000 notes due June 26, and to pay other pressing obligations. The amount of refunding mortgage bonds authorized was \$85,000,000 of which \$62,500,000 were to be reserved for refunding purposes, and the balance to be used for betterments, equipment, construction, etc. The company has been doing the work for which these bonds might be issued, but until now the bonds could only have been sold at a sacrifice.

SOUTHERN RAILWAY.—It is stated that the Southern Railway is to sell in the near future enough short-term notes to retire floating indebtedness and meet future expenses. It is said that a syndicate headed by J. P. Morgan & Co. will take these notes.

TOLEDO & OHIO CENTRAL.—The Little Kanawha syndicate turned over the Marietta, Columbus & Cleveland to the Toledo & Ohio Central for operation on Feb. 1. The Toledo & Ohio Central officials, it is said, claim that the physical condition of the property is such that its retention is undesirable and refuse to operate the road.

WESTERN MARYLAND.—The Mercantile Trust Company has been given an order permitting it to sell the entire capital stock of the George's Creek & Cumberland, which has been pledged with it by the Western Maryland to secure a loan of \$1,101,875. The stock may be sold at public auction any time within 30 days.

WESTERN PACIFIC.—The Denver & Rio Grande, on behalf of the Western Pacific, has sold to Blair & Co., William Salomon & Co., and William A. Read & Co., of New York, \$15,000,000 2-year 6 per cent. convertible notes. It is said that the money from this sale will finish the Western Pacific and provide it with equipment.